U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-274 911

Air Pollution Abstracts
Vol. 7, No. 6d

Environmental Protection Agency, Research Triangle Park, N C

Jun 76

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. APABCA-7-6d-1976	2.	3. RECIPIENT'S ACCESSION NO. PB274911
4. TITLE AND SUBTITLE Air Pollution Abstracts Volume 7, No. 6d		5. REPORT DATE June 1976 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Air Pollution Technical Information Center Research Triangle Park, North Carolina 27711		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS Same		13. TYPE OF REPORT AND PERIOD COVERED 14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions, Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 61349 - 62797.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air pollution Abstracts Information retrieval		13B 5B

18. DISTRIBUTION STATEMENT Unlimited	19. SECURITY CLASS *(This Report)*	21. NO. OF PAGES 289
	20. SECURITY CLASS *(This page)*	22. PRICE PC A13 MF A01

EPA Form 2220-1 (9-73)

PB 274 911

Volume 7, No. 6d
June 1976
CODEN:APABCA
ISSN:0027-5956

AIR POLLUTION ABSTRACTS

61349-62797

JUNE 1976
PART 4

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, N. C. 27711

AIR POLLUTION ABSTRACTS

VOLUME 7, NO. 6D JUNE 1976

Prepared by
Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

Subscribers receiving 'Air Pollution Abstracts'
directly from the U. S. Government Printing Office
should address any inquiries regarding issues
subsequent to June 1972 to:

U. S. Government Printing Office, Washington, D., C. 20402

The Administrator of the Environmental Protection Agency has determined that the publication of this periodical is necessary in the transaction of public business required by law of this Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through March 31, 1975.

CONTENTS

Page
Introduction 3
APTIC Publications 5
Subject Fields and Scope Notes 11
Abstract Bulletin 13
Subject Index SI-1
The terms that most closely describe the information presented in the documents are arranged alphabetically.
Author Index AI-1
Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Semiannual cumulative indexes to both subject and author are also sent to all recipients of this monthly publication.

EPA's staff should direct requests for full text duplicates (if not locally available) to APTIC, using the order form provided. Translations of foreign language documents may be arranged for these personnel upon request. Commercially available translations may also be requested from APTIC.

For non-EPA reader APTIC can provide copies of only those articles that have been written by EPA's air pollution personnel and have not been published in the open literature. Requests for all other articles should be directed to local libraries, publishers, or authors, with the following exception. Copies of EPA's numbered air pollution technical publications, as indicated in the citation, will be provided, while supplies permit, only to certain qualified requesters, e.g., its current contractors, grantees, and air pollution control agencies; a list of these publications is available. When requesting any publications, please include the complete citation. Translations are cited with their sources whenever possible. If a translation proves to be unavailable from the source cited, or if a translation is cited without a source, it may be located through APTIC or through the National Translations Center, 35 West 33rd Street, Chicago, Illinois 60616. In order to promote scientific and technical progress by facilitating access to each of the abstracted documents, APTIC is assuring that they are also held at EPA Headquarters and at each of the EPA Regional Offices. Information regarding their accessibility may be sought from the libraries there. Their addresses are:

U.S. Environmental Protection Agency
Region I Library
Room 2211-B, JFK Federal Building
Boston, Massachusetts 02203

U.S. Environmental Protection Agency
Region II Library
26 Federal Plaza
Room 908
New York, New York 10007

U.S. Environmental Protection Agency
Region III Library
Curtis Bldg., 6th and Walnut Streets
Philadelphia, Pennsylvania 19106

U.S. Environmental Protection Agency
Region IV Library
1421 Peachtree Street, N.E.
Atlanta, Georgia 30309

U.S. Environmental Protection Agency
Region V Library
230 Dearborn Drive Room 1455A
Chicago, Illinois 60604

U.S. Environmental Protection Agency
Region VI Library
1600 Patterson Street
Dallas, Texas 75201

U.S. Environmental Protection Agency
Region VII Library
1735 Baltimore Avenue, Room 249
Kansas City, Missouri 64108

U.S. Environmental Protection Agency
Region VIII Library
1860 Lincoln Street, Suite 900
Denver, Colorado 80203

U.S. Environmental Protection Agency
Region IX Library
100 California Street
San Francisco, California 94111

U.S. Environmental Protection Agency
Region X Library
1200 Sixth Avenue
Seattle, Washington 98101

U.S. Environmental Protection Agency
Headquarters Library, Room 2404
Waterside Mall
401 M Street, S.W.
Washington, D. C. 20460

When NTIS or DDC or GPO appear at the end of the citation, they designate the sales outlet offering the document. NTIS refers to: National Technical Information Service, U. S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161, Telephone (703) 321-8543. The designation NTIS is followed by their order number. NTIS sells paper copies at various prices and microfiche at $2.25. All foreign buyers must add the following charges to each order: $2.50 for each paper copy, and $1.50 for each microfiche. If payment does not accompany a U.S. order, NTIS will charge an additional $5.00 per order. DDC refers to: Defense Documentation Center, Cameron Station, Alexandria, Virginia 22314. Users registered at DDC may order such documents from them at the same prices as NTIS'. GPO refers to: Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Telephone (202) 541-3311. GPO sells paper copies at various prices; GPO does not sell microfiche. Payment must accompany all orders to GPO.

The serial publications (journals, periodicals, etc.) being scanned number approximately 7,000. A list of approximately 1,000 of the most productive publications with the address of each publisher is available upon request.

As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching ---more than those included in the subject index in each issue.

Acknowledgement is given to the Technical Publications Branch, Informational Services Division, Office of Administration, Research Triangle Park, N.C. for the make-up of the cover and for arrangement of printing and distribution.

Feedback from our users, including suggestions of articles, are always welcome.

APTIC Publications

Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:126, $0.65.

Air pollution Aspects of Emission Sources: Primary Copper Production - A Bibliography with Abstracts, June 1973 GPO No. EP 4.9:125, $0.70.

Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography with Abstracts, March 1973, GPO No. EP 4.9:121, $2.35.

Air Pollution Aspects of Emission Sources: Primary Aluminum Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:119, $0.90.

Mercury and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:114, $1.25.

Odors and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:113, $3.00.

Air Pollution Aspects of Emission Sources: Petroleum Refineries - A Bibliography With Abstracts, July 1972, GPO No. EP 4.9:110, $1.25.

Air Pollution Aspects of Emission Sources: Iron and Steel Mills - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:107, $1.00.

Air Pollution Aspects of Emission Sources: Boilers - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:105, $2.00.

Hydrochloric Acid and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:100, $0.55.

Chlorine and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:99, $0.55.

Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:96, $2.25.

Air Pollution Aspects of Emission Sources: Cement Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:95, $0.50.

Air Pollution Aspects of Emission Sources: Sulfuric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:94, $0.65.

Air Pollution Aspects of Emission Sources: Nitric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:93, $0.45.

Air Pollution Aspects of Emission Sources: Municipal Incineration - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:92, $1.00.

Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes), March 1971, GPO No. EP 4.9:88, $6.25.

Beryllium and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:83, $0.40.

Asbestos and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:82, $0.50.

Municipal Incineration: A Review of Literature, June 1971, GPO No. EP 4.9:79, $1.00.

Hydrocarbons and Air Pollution: An Annotated Bibliography (2 Volumes), October 1970, GPO No. HE 20.1309:75, $5.00.

The acronym GPO which appears in the above listing refers to: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Orders should be directed to GPO only; payment must accompany all orders.

RECENT CONTRACT AWARDS

from the

Durham Contract Operations
Contracts Management Division, EPA

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EFFECTS-HUMAN HEALTH

1976

61349 **APTIC NO. 84575**

Adachi, M., Y. Nitta, M. Murai, A. Iwasaki, A. Yoshida, and T. Motomiya

SOME DISCUSSION ON THE MORBIDITY SURVEY OF RESPIRATORY SYMPTOMS WITH WOMEN AS THE SUBJECTS. *(Joshi o taisho to shita kokyuki shojo yushoritsu chosa ni kansuru 2,3 no kento). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 31(1):170, April 1976.*

Since almost all women are non-smokers without chance of exposure to occupational harmful gases and vapors but as almost constantly exposed to environmental pollution in their residential area, they may be considered appropriate objects representatives of air pollution effects in the area. Examination was carried out on the morbidity of continued coughing and sputum concerning the correlated morbidity by sex, age, and smoking amount, male morbidity corrected by smoking amount, and air pollution. The utilized materials were the result of female morbidity of continued coughing and sputum from 1970-1975, especially between ages 40-59. Female morbidity (Pf) showed a positive correlation to the corrected morbidity by sex, age, and smoking amount (P), Pf being equal to P multiplied by 0.75 minus 0.65, where the corre ation coefficient is 0.194 with v less than 0.01. A positive correlation with correlation coefficient of 0.86 was found between the male corrected morbidity by age and smoking amount (Pm) and the Pf. A positive correlation with correlation coefficient of 0.77 was found between the male non-smoker morbidity and the Pf. Between Pf and degree of air pollution during the most recent 3 years, a trend was found such that Pf increases with the increasing degree of air pollution; i.e., Pf was represented by pphm of sulfur dioxide multiplied by 1.61 minus 0.83. The utilization of only women to see the effect of air pollution has been proven appropriate.

61350 **APTIC NO. 84574**

Adachi, S.

ON THE CHANGE OF RESPIRATORY DISEASE SYMPTOMS AND OF LUNG FUNCTION WITH YEAR IN PRIMARY SCHOOLCHILDREN IN KASHIMA AREA, IBARAGI PREFECTURE. *(Ibaragiken Kashimachiku shogakusei no kokyuki shojo to haikino no keinen hendo). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 31(1):169, April 1976.*

Primary schoolchildren in 4 schools surrounding the Kashima coastal industrial area were compared to those in 3 schools located 15 km away from the area. The yes-response rate (%) on questions of respiratory symptoms and respiratory disease history in 1973 and 1974 was 3.4 and 3.1 in pneumonia, 4.4 and 4.9 in asthma, 8.0 and 9.7 in throat pain, 25.3 and 21.7 in coughing, and 24.3 and 23.5 in rhinitis in the subject group. The corresponding rates in the control group were, respectively, 1.1 and 0.5, 1.1 and 2.1, 4.0 and 8.3, 21.0 and 14.0, and 14.2 and 14.0. There was a correlation between pain in throat and coughing and pyrexia and between rhinitic symptoms and sputum, suggesting the reasonableness of the complaints. No correspondence was found between respiratory disease symptoms and efforted vital capacity and 1-second volume.

61351 **APTIC NO. 84596**

Amaya, K.

VARIOUS PROBLEMS IN AIR POLLUTION AND FUTURE PROBLEMS. *(Taikiosen ni okeru shuju no mondai to kongo no kadai). Text in Japanese. Preprint, General Research Society for Environmental Science, Japan, p. 62-63, 1976. (Presented at the Environmental Science Meeting, 2nd, Tokyo, Japan, June 4, 1976.)*

The cause of severe injury thought to be due to oxidant may be the combined action of cyanide and ammonia. Although a high concentration of cyanide was not detected at a place where apparent oxidant injury occurred, there are such cases where cyanide existed in the atmosphere and was detected in rainwater at 2-8 ppm. Increased ammonia has been found in the atmosphere on days of photochemical smog; there is a possibility of ammonium cyanide, which dissolves easily in water. Dust-form cyanide could act at strenghts nearly a hundred times that of gaseous cyanide, especially in cases where people engage in exercise that increases respiration, resulting in cyanide intoxication.

61352 **APTIC NO. 82437**

Araki, Shunichi

MINUTE AMOUNTS OF LEAD, REACTIONS IN LIVING BODY, SECOND PART, HEAVY METAL POISONING. *(Jukinzoku Chudoku 2. Biryo no namari to seitaihanno o megutte). Text in Japanese. Igaku no Ayumi (Progr. Med.), 96(2):70-78, 1976. 210 refs.*

The behavior of lead in the ecosystem, and in causing latent peripheral nerve disturbances is discussed. About 98% of the lead in the atmosphere is due to the combustion of leaded gasoline by automobiles; in a busy area in Tokyo the content is 2.6 microgram pb/cu m. Human absorption, excretion, and accumulation of lead, the lead burden, and the index of reaction of lead in the body are described. Reactions of lead in the body, especially in the hematopoietic system, the nervous system, the kidney, the circulatory system, and other organs are described in detail. Adenoma in rats is emphasized.

61353 **APTIC NO. 81901**

Babcock, Lyndon R., Jr. and Niren L. Nagda

POPEX - RANKING AIR POLLUTION SOURCES BY POPULATION EXPOSURE (FINAL REPORT). *Illinois Univ., Medical Center, Chicago, Environmental Protection Agency Grant R-802111, Program Element 1AB012, ROAP 21ADK-031, Rept. EPA-600/2-76-063, 341p., March 1976. 101 refs.*

A computer model, called popex, which ranks air pollution sources by population exposure is described. The model consists of three submodels which treat dispersion, population exposure, and health effects. The health effects submodel is based on derived tolerance factors for exposure to oxidants, sulfur dioxide, nitrogen oxides, carbon monoxide, particulate matter, and hydrocarbons. The model is applied to air pollution sources in the Chicago Air Quality Control Region and reveals that 17 out of a total of 227 source categories contribute nearly 80% to the total air pollution-population-health effect problem. These 17 categories include commonly recognized large sources such as automobiles and large utility and industrial boilers as well as lesser recognized categories such as solvent evaporation from surface coating operations. (Author summary modified)

61354 **APTIC NO. 82725**

Bar-Shalom, Y., A. Segall, and D. Budenaers

DECISION AND ESTIMATION PROCEDURES FOR AIR CONTAMINANTS. *Preprint, Systems Control, Inc., Palo Alto, Calif. and Massachusetts Inst. of Tech., Cambridge, Electronic Systems Lab., 13p., 1976. 15 refs.*

Decision and estimation procedures for enforcing average exposure standards for atmospheric contaminants in an industrial environment based on short period samples are presented. The air quality measurements are assumed to be lognormally distributed with unknown mean and variance. The statistical mean of these measurements is the best approximation of the arithmetic average exposure of a worker in the environment under examination. This mean is tested against the standard; and if there is a sufficiently high confidence, i.e., probability of a wrong decision below a prescribed level, then it is possible to state that a violation occurred or that a compliance situation exists. Otherwise no decision can be made. Decision charts are obtained for various allowable probabilities of error, and the decision is obtained by simply plotting a point on the decision chart and observing in which region it falls.

61355 **APTIC NO. 75311**

Berman, Ezra and Charles G. Liddle (eds.)

BIBLIOGRAPHY OF THE CAT: REVISED EDITION. *Environmental Protection Agency, Research Triangle Park, N. C., Health Effects Research Lab., Program Element 1FA082, Rept. EPA-600/1-76-007, 639p., Jan. 1976. 2300 refs.*

A bibliography containing more than 2300 references to scientific and clinical literature about the cat as a laboratory animal is presented. The majority of citations are accompanied by an abstract. An alphabetical listing of authors is also provided along with a cross-index of the references by subject descriptors. Subjects covered in the references include: studies involving inhaled toxic material, the cat respiratory system, chemical and physical toxicity, immunology, tumors and neoplasms, statistics and models, infectious diseases, and various biological processes, functions, and disorders of the cat.

61356 **APTIC NO. 83190**

Chujo, E. and K. Owada

RESULTS OF SURVEY ON THE EFFECTS OF AIR POLLUTION ON HUMAN HEALTH IN FUKUSHIMA AREA, OSAKA CITY. *(Osakashi fukushima chiku ni okeru kaiki osen no kenko ni oyobosu eikyo chosa). Text in Japanese. Koshu Eisei Joho (Public Health Inform.), 6(2):22-23, Feb. 1976.*

In Fukushima Ward, Osaka City, the effect of combined air pollution was studied with respect to geography and motor traffic. The results of respiratory function examinations of 213 complaining persons in the western part of the ward, and the results of BMRC type-questionnaires, blood pressure, urinalysis, chest roentgenography, and pulmonary ventilation tests on 136 persons living more than 3 years there, and the results of a pulmonary function examination of 213 inhabitants of all Fukushima Ward with complaints of continued coughing and sputum are given. In the Ebie-Western district, 19.5% of the men and 13.7% of the women showed health impairment. In industrial zones and sub-industrial zones, 14.3% and 34.3% respectively of the examined inhabitants had some disturbance of pulmonary function. From 120 persons examined, 42 persons (35%) showed some respiratory function impairment. Nonsmokers showed a higher frequency than smokers.

61357 **APTIC NO. 83341**

Culver, Bruce and Stata Norton

JUVENILE HYPERACTIVITY IN RATS AFTER ACUTE EXPOSURE TO CARBON MONOXIDE. *(Exp. Neurol., 50(1):80-98, 1976. 41 refs. (Presented at the American Society for Pharmacology and Experimental Therapeutics, Montreal, Quebec, Aug. 1974.)*

Five-day old rats were exposed in a dynamic flow chamber to a concentration of carbon monoxide in air which caused coma and respiratory failure after 2 hr of exposure. From 7-15 days after birth, signs of hyperactivity were present in the CO- exposed rats in an open field test. In the same age periods, tests of reflex development did not demonstrate differences between CO-exposed and control rats. From 17-22 days of age, the CO-exposed rats were more often awake in the nest box than control rats. After weaning, the CO-exposed rats were hyperactive, particularly at night, in a residential maze. The rats recovered by 3 mo of age. When adult rats were exposed to CO, mild nocturnal hyperactivity usually developed several weeks after exposure, and no recovery was found up to 5 mo later. (Author abstract modified)

61358 **APTIC NO. 83810**

Dyer, Robert F. and Victor H. Esch

POLYVINYL CHLORIDE TOXICITY IN FIRES. HYDROGEN CHLORIDE TOXICITY IN FIRE FIGHTERS. *J. Am. Med. Assoc., 235(4):393-397, Jan. 26, 1976. 10 refs.*

The hazards of polyvinyl chloride resulting from its toxicity in fires is discussed. Respiratory distress develops in fire fighters and fire victims after exposure to combustion products. The thermal degradation of polyvinyl chloride results in the formation of at least 75 identifiable potentially toxic compounds. Three characteristics of plastic fires are the extremely high temperatures, very high burning rates, and thick toxic smoke. The main danger to exposed fire fighting personnel is from the massive formation of hydrogen chloride gas, and its adsorption on spherical soot particles that are carried into the victims respiratory tracts. Control of hazardous building designs, including equipment and ventilation, is necessary. Protection by masks during the overhaul phase is required. Sophisticated air sampling techniques are required for definitive study, including gas chromatography. (Auther conclusions modified)

61359 **APTIC NO. 84598**

Endo, R., K. Namie, and K. Takemoto

EFFECTS OF AIR POLLUTION ON THE RESPIRATORY SYSTEM OF BIRDS PART 2. *(Taikiosen no tori-kokyuki no oyobosu eikyo Part 2). Text in Japanese. Kogai Kenkyu Nenpo (Annu. Rept. Tokyo Metropol. Res. Lab. Environ. Pollut.), vol. 1976:238-239, July 1976.*

Japanese quails (numbering 180) were divided into 4 groups. Physiological saline solutions (0.2 ml) containing carbon powder, carbon powder with methylcholanthrene, or methylcholanthrene were infused into the lungs (the last group was used as a control). The dosage of methylcholanthrene was 3 mg/100 g body weight and that of carbon powder was 3 mg/bird. After 6, 12, and 24 months, respectively, they were sacrificed by blood-letting and their lungs were removed and fixed for microscopic observation. Microscopic histopathological examination found major proliferative change in the birds given carbon powder and methylcholanthrene in the tertiary bronchi, especially prominent on the epithelium around the diverticulum. In the birds given only carbon powder and those given carbon powder and methylcholanthrene, lymthatic tissue was almost not recognized. Neurotic change and pulmonary cavernation were observed in the groups exposed to methylcholanthrene and to carbon powder plus methylcholanthrene; however, this tissue destruction continued for more than a year in the latter group. The persistence of carbon powder was high. The action of methylcholanthrene was greater with carbon powder. Carcinogenesis was found in only one bird.

61360 **APTIC NO. 83078**

Evans, Michael J., Lincoln V. Johnson, Robert J. Stephens, and Gustave Freeman

CELL RENEWAL IN THE LUNGS OF RATS EXPOSED TO LOW LEVELS OF OZONE. *Exp. Mol. Pathol., 24(1):70-83, Feb. 1976.*

The effects of low levels of ozone on cell renewal in the lungs of rats were investigated. Rats were exposed to O3 (0.35 + or - 0.5 ppm. or 0.5 + or - 0.5 ppm) for up to 8 days and dividing cells were labeled. All labeled cells increased and then decreased to near control levels within 4 days. Type 2 cells showed the largest change in labeling index. The labeling indexes decreased by the fourth day despite continuous exposure and no further injury occurred. Groups of animals adapted to O3 were exposed to high concentrations of O3 and the labeling indexes of Type 2 cells were studied. Tolerance to the initial concentration did not ensure total protection to rats against reexposure to high concentrations of O3. (Author abstract modified)

61361 **APTIC NO. 83080**

Fahim, M. S., Z. Fahim, and D. G. Hall

EFFECTS OF SUBTOXIC LEAD LEVELS ON PREGNANT WOMEN IN THE STATE OF MISSOURI. *Res. Commun. Chem. Pathol. Pharmacol., 13(2):309-332, Feb. 1976. 36 refs.*

The effects of subtoxic lead levels on pregnant women were investigated in the state of Missouri. The incidence of term pregnancies with early membrane rupture was 0.41% in 249 women in Columbia (Region I) and 17% in 253 women in Rolla (Region II) near lead mining areas. The incidence of premature deliveries was 3 and 13.04%, respectively. Lead concentrations in blood and placental tissues of term pregnancies revealed no significant changes. In term with early membrane rupture, the blood concentration of Pb was higher, as was the case in placental tissues and cord. Lead concentration was highest in membrane tissues. Tissue Pb content in microgram/100 g (Regions I and II respectively) was: placenta 6.0 + or - 0.01 and 7.0 + or - 0.03; cord, 11.0 + or - 0.34 and 12.0 + or - 0.18; membrane, 38.9 + or - 2.64 and 45.3 + or - 3.12. There was a high positive correlation between Pb concentration in maternal and fetal blood. Both were significantly higher in preterm pregnancies and early membrane ruptures than in term pregnancies. (Author abstract modified)

61362 **APTIC NO. 82483**

Finelli, V. N., M. Karaffa, M. Malanchuk, R. M. Danner, L. McMillan, and S. D. Lee

BIOLOGICAL EFFECTS OF CARBON MONOXIDE VS. WHOLE EMISSIONS FROM ENGINE CATALYST. *J. Air Pollution Control Assoc., 26(3):231-233, March 1976. 10 refs.*

The biological effects of exposure to whole emissions from engines with and without converters and exposure to carbon monoxide alone are compared. Rats were exposed for 4 wk to CO alone at levels of 57.5, 172.5, and 517.7 mg/cu m or to nonirradiated (NI) or irradiated (I) exhaust emissions. The growth patterns of rats exposed to emissions involving catalysts or to CO (575 mg/cu m) were not significantly different from those of the control. The CO levels in the NI and I chambers averaged 10.7 and 11.5 mg/cu m. The weights of lung, liver, and kidney were not affected in any exposed animals. The catalytic converter eliminated the deleterious effects due to CO by greatly reducing the emission of the CO. The converter was effective in preventing organ damages due to other toxic components of auto emissions yet to be identified.

61363 **APTIC NO. 84678**

Fukuda, M.

LACHRYMAL LYSOZYME AND PH ON THE OCCASION OF PHOTOCHEMICAL SMOG. *(Kokagaku smog ji no namida lysozyme, pH e no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 11(1):56, 1976.*

In order to objectify ocular irritation due to photochemical smog, tear samples were taken four times from about 30 pupils of a middle school at times when oxidant concentrations were 0.11, 0.12, 0.17 and 0.03 ppm. Lysozymal activity and pH showed significant lowest values of 1700 microgram/ml and pH 6.98 when oxidant was 0.17 ppm, as compared to 2100 microgram/ml and a pH of 7.13 when oxidant was 0.03 ppm. The lysozyme of egg white was exposed to several air pollutants to determine the reduction of lysozymal activity. The activity was reduced to 40% and 25% after exposure to ozone at 1 ppm for 5 min and at 0.2 ppm for 40 min, respectively. Exposure to sulfur dioxide at 40 ppm, carbon monoxide at 800 ppm, nitrogen dioxide at 200 ppm, a nitrogen monoxide and dioxide mixture at 150 and 300 ppm, acrolein at 50 ppm, and formaldehyde at 25 ppm gave no reduction of the activity or pH. After exposing 10 volunteers to ozone at 1 ppm for 10 min, no reduction of lysozymal activity was noticed, but pH was reduced. These results indicate that the irritation of the eye was in relation to reduction of lachrymal pH.

61364 **APTIC NO. 84559**

Goto, H. and E. Yokoyama

EFFECTS OF SULFURIC ACID MIST ON RESPIRATORY FUNCTION OF SMALLER ANIMALS PART 2. *(Ryusan mist no shodobutsu kokyu kino ni oyobosu eikyo). Text in Japanese. Japanese Society of Industrial Hygiene, Japanese Society Industrial Hygiene Annual Meeting, 49th, 1976, p. 480-481. (April 2-3.)*

Groups of Wistar SPF male rats and male guinea pigs were exposed to different sulfuric acid mists (average diameter 5.8 and 1.6 micron at 1-24 mg/cu m and 3.3-30.2 mg/cu m respectively for 1 hr). Other groups of the rats were exposed to ozone at 2 ppm for one hr before the mist exposure, to ozone at 1 ppm for 3 hr 3 days before the mist exposure, and to ozone at 2 ppm for 3 hr 3 days before the mist exposure. The exposures to the mist and to ozone for 3 hr were carried out under anesthesia using ethyl carbamate and chlorarose. The heart beat and the pulmonary water content did not show any change in the first group of rats, nor did the pressure-volume relationship of removed lungs. Many rats exposed only to the mist showed colors indicating congestion with spotlike hemorrhage in the removed lungs and increased tracheal secretion. In the rats pre-exposed for 1 hr to ozone, these symptoms were lighter. The exposed guinea pigs also showed congestion and spot-like hemorrhage in the lungs. The effects on rats of differences in the droplets of sulfuric acid mist, effects on respiratory resistance and dynamic compliance, were almost the same as for the guinea pigs. In the 2 groups exposed to ozone 3 days before exposure to the mist, the change of these measures was less than for animals

61365 **APTIC NO. 84161**

Herzog, P.

THE INFLUENNCE OF ALTITUDEE ON THE CARBON MONOXIDE INTOXICATION OF HUMANS. *(Der Einfluss der Hoehenlage auf die Kohlenmonoxid- Vergiftung von Menschen). Text in German. Oesterr Ing., 19(2):54-59, 1976. 17 refs.*

The influence of altitude on carbon monoxide poisoning in man is discussed. The toxic effect is due to the reaction of CO with hemoproteins. The most important of the reactions is the reversible binding of CO with hemoglobin into carboxyhemoglobin (COHb). Carbon monoxide could lead to inner asphyxiation at a sufficiently high concentration, but it also directly affects the heart, blood vessels, CNS, and brain. Acute CO-intoxication, traceable to an excessive COhb saturation, causes headache, vertigo, and partial then deep unconsciousness with convulsions. The COHb saturation was a function of the CO concentration in the inhaled air, the length of exposure, and respiratory capacity. It was established that rising respiratory capacity (hyperventilation) and diminished O2Hb (oxyhemoglobin) occur with increasing altitude, resulting in a more severe intoxication at the same concentrations than at sea level. This is attributable to a lower O2Hb dissociation, since the balance of the blood hemoglobin (with falling O2-partial pressure) is increasingly less O2-saturated. A study of the CO-content in respiratory air at constant O2Hb at various altitudes was undertaken. A graphic presentation for an induction period of 30 min (a ride through a tunnel) yielded the corresponding limits. Thus with a value of O2Hb of 93%, at which no complaints occurred, and the permissible CO concentration as a function of altitude, intermediate values could be determined by linear interpolation.

61366 APTIC NO. 84570

Hirose, Y., H. Inoue, M. Kawakami, S. Nagashima, T. Aoki, S. Shimura, S. Maeda, S. Sato, T. Sasaki, and T. Takishima

FUNCTIONAL AND MORPHOLOGICAL STUDIES OF THE LUNGS OF RABBITS EXPOSED TO OZONE, COMPARISON OF CLOSING VOLUME AND PATHOLOGICAL MORPHOLOGICAL CHANGE. *(O3-Bakuro kato hai no kno teki keitaiteki kenkyu - closing volume to byori keitai hendo tono hikaku kento). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), vol. 1976:124, 1976.*

The relationship between closing volume and pathological morphological change was examined as a physiological detecting method of peripheral airway disease. After exposing male rabbits to ozone for 12 hr, they were anesthetized, kept in a box, and artificially ventilated, and their closing volume, nitrogen concentration, volume-flow, and transpulmonary pressure were determined. The lungs were then removed and sliced. The closing volume percentage, nitrogen difference, and nitrogen washing index were 30.1 + or - 11.6%, 1.85 + or - 0.98/30 ml, and 0.17 + or - 0.06, respectively, as compared to 19.16 + or - 3.6, 1.30 + or - 0.20 and 0.19 + or - 0.31 for non-exposed rabbits. No relationship between ozone concentration and the data was found; however, the percentage of closing volume and the nitrogen concentration of exposed rabbits were abnormal. Microscopically, proliferation of epithelial cells and slight infiltration of lymphocytes around the peripheral airway were observed. Use of a scanning electron microscope revealed reduction and swelling of cilia and disorder of the wall of bronchioles, and an increase of the number and the dimension of Kohins pore in alveoli. Electron microscopy showed degeneration and collapse of alveolar epithelium, and edematous changes of the alveolar wall in exposed rabbits.

61367 APTIC NO. 81720

Hirota, J. and Y. Yamamura

RESULTS OF SURVEY ON THE DIFFERENCE OF MERCURY IN EXPIRED AIR AND EXCRETA IN INHABITANTS LIVING IN POLLUTED AND NON-POLLUTED AREAS. *(Suigin joki no taiki level ni okeru osenchiiki to seijochiiki kyojusha tono kokichu sonotano haisetsu isa ni tsuiteno jittai chosa). Text in Japanese. Koshu Eisei Joho (Public Health Inform), 6(1):20-21, 1976.*

Mercury concentrations in urban air show higher local values near mercury handling factories and sewage treatment installations. Results of measurements of mercury in the air in factories and neighboring areas are discussed. Mercury in the blood and in exhaled air of employees in such factories was measured before work. As mercury thermometer manufacture is usually a household industry, the effect of mercury appear also in the manufacture s wife and children, the mercury content in urine and blood being 300-96 and 336-58 microgram/l and 13-6.7 and 15-8 microgram/ 100 gram of blood respectively. After removing to the suburbs, urinary mercury and mercury in mercury-poisoned patients showed a reduction. In a mercury thermometer factory in both crowded areas and in well-ventilated areas, mercury content in the factories was the same; however, the content of mercury in outdoor air and in the employee s blood was lower in the ventilated areas. The mercury content of blood did not increase much when the outdoor air concentration was lower, even when the level of mercury exposure was the same.

61368 APTIC NO. 81091

Holbrook, David J., Jr.

ASSESSMENT OF TOXICITY OF AUTOMOTIVE METALLIC EMISSIONS. VOLUME I: ASSESSMENT OF FUEL ADDITIVES EMISSION TOXICITY VIA SELECTED ASSAYS OF NUCLEIC ACID AND PROTEIN SYNTHESIS (FINAL REPORT). *North Carolina Univ., Chapel Hill, Dept. of Biochemistry, Environmental Protection Agency Contract 68-02-1205, Program Element 1AA601, Rept. EPA-600/1-76-010a, 67p., Jan. 1976. 13 refs.*

In vivo and in vitro experiments with rats are performed to assess the relative toxicities of salts of manganese, lead, palladium, and platinum. These metals are found in automotive emissions and result from the addition of metals to gasoline as well as the use of catalytic converters containing platinum and palladium. Acute toxicities (median lethal doses) are reported for platinum chloride, platinum sulfate, palladium chloride, manganese chloride, palladium sulfate, ruthenium chloride, and oxides of platinum, lead, palladium, and manganese. Concentrations of metallic ions following dietary administration are also reported. Hepatic microsomes are isolated, and the following parameters related to in vitro drug metabolism are recorded: yield of microsomal protein/g liver, in vitro activities of aniline hydroxylase and aminopyrine demethylase, and the content of cytochrome P-450 and b5/mg microsomal protein. A rapid and convenient method for the analysis of ribosomal ribonucleic acid during studies of RNA is also outlined.

61369 APTIC NO. 84546

Homma, Katsunori

LUNG RETENTION OF METALLIC FUMES. III. LUNG RETENTION RATE OF POLYDISPERSED IRREGULAR FUMES IN LUNG OF RATS. *(Kinzoku hume no hainai chinchaku ni kansuru kenkyu 3. Tabunsan-fuseikei fume no rat hainai e no chinchaku ritsu). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 30(6):639-644, Feb. 1976. 14 refs.*

Rats inhaled polydispersed irregular antimony fumes with mass aerodynamic median diameters (AMD) of 0.36, 0.77, and 1.1 micrometer for 90 min. The determined rate of relative deposition (RL) obtained by sacrificing and determining the deposited amount of antimony showed the following relationship to the fume diameter: RL equals K times -nth power of AMD(Da). The same formula as was found for the monodispersed spherical fumes of lead or tellurium; however, the deposition index n was as large as 1.34 as compared to 0.72 and 0.36, respectively, for lead and tellurium. The larger the particle, the lower the rate of deposition. Considering the biological action and the solubility of metal in water, inhalation experiments were carried out using cadmium and lead dichloride and the results showed nearly the same n as for lead. The large value of n in the case of antimony and the low deposition value of tellurium were studied in the second part of this report.

61370 APTIC NO. 84568

Homma, K.

LUNG RETENTION OF METALLIC FUMES. II. LUNG RETENTION RATE OF MONODISPERSED SPHERIC METALLIC FUMES IN A LUNG OF RATS. *(Kinzoku hume no hainai chinchaku ni kansuru kenkyu 11. Tanbunsan-Kyukei kinzoku hume no rat hainai e no chinchaku). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 30(6):632-638, Feb. 1976. 17 refs.*

Inhalation by rats of monodispersed (mass aerodynamic median diameter of 0.2-3.2 micrometer) spherical lead and tellurium, at concentrations of 15.2-93.2 and 6.6-89.2 mg/cu m respectively for 90 min was carried out in a chamber. After sacrifice of the rats and determination of relative deposition of the metal in the lung, a relation between the relative deposition rate of metal in the lungs and mass aerodynamic median diameter (Da) of the hume particel was found: RL equals K multiplied by the minus nth power of Da where K and n are constants obtained by experimentation. The constant n, the depostion index, is constant irrespective of the materials inhaled. When the formula was approximated to the ICRP model, n was 0.74 and the experimental value was 0.72 for lead and 0.36 for tellurium.

61371 **APTIC NO. 84668**

Horiguchi, Y.

ON THE REINFORCING ABILITY OF OZONE AND OF ETHYL NITRITE TO THE BIOLOGICAL EFFECTS OF ACROLEIN. *(Acrolein no sayo ni taisuru ozone narabini asyosan ethyl no zokyo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 11(1):55-56, 1976.*

Acrolein, ethyl nitrite, and ozone, singly and in combination were administered by inhalation to non-anesthesized male and female rabbits. The effects were studied by ECG, heart rate, arterial blood pressure, respiration movement, and eyelid movement. Except for a slight reduction of respiration, 10 ppm of acrolein for 15 min gave no effects; however, at 50 ppm there were conspicuous changes. Exposure to ethyl nitrite at a range of concentrations from 0.1-7 ppm for 100 min yielded no marked symptoms. Simultaneous exposure to 7 ppm ethyl nitrite and 10 ppm acroliein caused conspicuous changes, such as reduction of heartbeat, blood pressure, and respiration and accentuation of eyelid movement, none of which was seen in single component exposure. Exposure to ozone at 0.3 - 15.7 ppm gave no effect; however, at 50 ppm it caused suppression of respiratory movement and heartbeat. This effect was also noticed, to a lesser degree, with ozone at 3 ppm and acrolein at 2-4 ppm. Simultaneous exposure to ethyl nitrite at 7 ppm and to ozone at 5.3 ppm gave no effect. These facts show that the response of the circulatory and respiratory systems of rabbits was reinforced by simultaneous exposure to acrolein and ozone, and to acrolein and ethyl nitrite.

61372 **APTIC NO. 84664**

Ichikawa, I.

EFFECTS OF REPEATED EXPOSURE TO OZONE ON THE LUNG AND PULMONARY PHOSPHOLIPID METABOLISM OF RATS. *(Ozone kurikaeshi bakuro ni yoru rat hai oyobi hairinishishitsu taisha ni oyobosu eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 11(1):54-55, 1976.*

After exposing rats to ozone at several levels for various periods it was found that the total amount of phospholipid and phosphatidyl choline showed a tendency to decrease after short term exposure at relatively high concentrations, resulting in pulmonary emphysema. Lung slices were exposed to ozone. Ozone inhibited the intake of 32P, 3H-glycerol or 14C-fatty acids in the initial state of the synthesis of phosphatidyl choline. The effect was smaller at the stage when phosphatidyl choline has been structurally arranged. In experiments on enzyme levels, at the initial stage of ozone exposure, the enzymatic activity accelerated the depalmitoyl lecithin synthesis. Palmitoyl choline was found. Although no abnormality was seen after long-term exposure to ozone at relatively lower levels, an increase of the ratio of lung weight to total body weight and an increase of phospholipase AI activity were inhibited by short-term exposure to ozone at higher concentrations for a short period after prolonged exposure to low levels of ozone. This was less the case with rats exposed only once to higher ozone levels. The decreased activity of acylating enzymes due to exposure to ozone was the same in both cases.

61373 **APTIC NO. 84630**

Ikematsu, T., R. Endo, S. Nagaoka, and H. Saito

AIR POLLUTION AND TONSILS. PART 2. THE EFFECTS OF OZONE EXPOSURE ON RABBIT S TONSILS, OBSERVED BY SCANNING ELECTRON MICROSCOPE. *(Taikiosen to Hento. Part 2. Ozon bakuro hento ni oyobosu eikyo ni tsuite, tokuni Sosagata denshikenbikyo ni yoru kansatsu). Text in Japanese. Kogai Kenkyu Nenpo (Annu. Rept. Tokyo Metropol. Res. Lab. Environ. Pollut.), vol 1976:240-242, July 1976.*

Forty-eight Dutch rabbits aged 7 mo were exposed to ozone at 1 ppm for 10 days at 25 C and relative humidity 40-60%. The exposed rabbits were divided into 4 groups, and sacrificed immediately, one week, two weeks, and one month after the end of exposure. Their tonsils were removed and prepared for microscopic observation, especially by scanning electron microscope. The findings of scanning electron microscopy indicated that although epithelial ablation and omission, and cellular infiltration were clear on the tonsils removed immediately, one week, and two weeks after the end of ozone exposure, such changes could not be found one month after the end of exposure, suggesting formation of ozone-resistance. Observation by photomicroscope gave the same results.

61374 **APTIC NO. 84591**

Imagawa, U., S. Nagaoka, and R. Endo

EXAMINATION ON THE HUMAN EFFECTS OF AIR POLLUTION BY SPUTUM ANALYSIS PART 2. *(Kakutan bunseki ni yoru taikiosen no jintaieikyo no kentoo part 2.). Text in Japanese. Kogai Kenkyu Nenpo (Annu. Rept. Tokyo Metropol. Res. Lab. Environ. Pollut.), vol. 1976:235-237, July 1976.*

Six studies of cytological and histological observation of rats exposed to nitrogen dioxide, pulmonary changes of human lungs exposed to oxygen at high concentrations, rats exposed to tobacco smoke, glycoprotein in human sputum, and cytological diagnosis of the sputum of patients and of smokers are described. Additive effects resulted from increasing the number of exposures and shortening the interval between repeated exposures to nitrogen dioxide. Alveolar cells increased in number due to increasing the concentration of nitrogen dioxide. Chronic stromal pulmonary inflammation occurred after exposure to high concentrations of oxygen, with destruction and proliferation of argentophile fibers in the course of fibrosis. Conspicuous edema in the alveolar parenchyma and freed cells of the alveolar wall occurred after long-term exposure of young rats to tobacco, but without conspicuous change of the bronchial system. Although no significant difference was found in glycoproteins in sputum between polluted and non-polluted areas, the content of N-acetyl-neuramic acid and N-glycolneuramic acid tended to be greater in the sputum of patients in polluted areas. In polluted areas, although the increase of acidcytes was less, that of histocytes was higher in sputum of bronchial asthmatic patients. Only the increase of histocytes was noticed in chronic bronchitis patients, with an increase of neutrocytes in smokers. Proliferation of basal cells, metaplasia of squamous epithelium and of columnal epithelium and increase of goblet cells were found by cytological diagnosis of the sputum of heavy smokers.

61375 **APTIC NO. 84573**

Imai, M., K. Yoshida, M. Kitabatake, and H. Oshima

ON THE AIR POLLUTION AND MORTALITY IN THE YOKKAICHI AREA. *(Yokkaichi chiiki ni okeru taikiosen to shiboritsu ni tsuite). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 31(1):168, April 1976.*

The change of mortality in the Yokkaichi area from 1963 to 1974 was investigated by classifying the causes of death according to classification of statistics on diseases, injuries and deaths with correction of the population figure to that of the national population in 1935. The air polluted area was defined as the area officially appointed, and the control area was defined to be the total area with sulfur dioxide concentration less than 0.28mg/day and dust fall less than 6.8 ton/year. There was a good correlation between the morbidity of chronic obstructive respiratory diseases, especially pulmonary emphysema, and sulfur dioxide concentration, and dust fall. The number of deaths due to pulmonary diseases was 32, 42, and 32, respectively from 1963-1966, 1967-1970, and 1971-1974 with ages of 60.5, 60.6 and 66.9 in air polluted area, as contrasted to 32 from 1963 to 1974 with an age of 71.6 in non polluted area. The differences between the expected and observed deaths were 30 and 40 in excess, respectively, due to bronchial asthma and pulmonary emphysema with chronic bronchitis, from 1963 to 1974. Deaths due to respiratory malignant tumors are increasing in both areas at nearly the same rate, the cause being smoking rather than air pollution. The yearly average concentration of sulfur dioxide at one point in the air polluted area was 75, 60 46 and 22 ppb, respectively in 1964, 1967, 1971, and 1974.

61376 **APTIC NO. 84050**

Ishimi, Atsuko

EFFECTS ON LIVING BODY OF AIR POLLUTION METALS - STUDIES ON ACCUMULATION OF AIR POLLUTION MATERIALS CD, PB, FE, AND MN IN RAT S SEVERAL ORGANS. *(Taikichu kinzokuno seitai ni oyobosu eikyo. Taikichu Cd, Pb, Fe, Mn no rat tainai chikuseki ni kansuru kenkyu). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hygiene), 30(6):600-614, 1976. 32 refs.*

Wistar rats (8 weeks old) were reared in three areas, one polluted by metals, one slightly polluted, and one relatively nonpolluted, from July 1974 to July 1975 at about 25 C. They were sacrificed after 4, 8, and 12 months respectively. The concentrations of cadmium, lead, iron, and manganese in the air of 3 areas were obtained. The contents of Cd, Pb and Fe in the brain increased with time of exposure, and were especially highly in the highly polluted area. The content of Mn did not increase. Conspicuous accumulation of 4 kinds of metals was seen in the lungs, especially in the highly polluted area, and the accumulation significantly increased after each 4-month interval. In the liver and kidneys, Cd accumulated significantly with time; Pb in the kidneys, Fe in the liver, and Mn in the liver and kidneys increased with time, with a parallel increase of Cd, Pb, and Fe in blood and in the liver and kidneys. Many phagocytes were observed beneath the pleura, pulmonary alveoli, bronchi, and perivascular region. The concentrations of metals in the air in the highly polluted area were: 0.038 microgram Cd/cu m, 0.292 microgram Pb/cu m, 2.870 microgram Fe/cu m, and 0.212 microgram Mc/cu m, yearly average. The peak size of metal-containing dusts was less than 2 micron for dusts containing Pb and Cd, and 8 micron for dusts containing Fe. Dusts containing Mn ranged widely in size.

61377 **APTIC NO. 84631**

Ishimi, A., M. Omoto, and A. Nukada

EFFECTS OF METALS IN ATMOSPHERE ON LIVING BODIES. PART 1. *(Taikichu kinzoku no seitai ni oyobosu eikyo (1)). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 31(1):162, April 1976, Paper 304.*

To determine the long-term effects of metals on mammals, male Wistar rats were reared from after 4 wk of birth in locations with different degrees of air pollution by metals, sacrificed at 4, 8 and 12 mo of rearing, and measured for the contents of cadmium, lead, iron and manganese in their brain, lung, liver, kidney, blood and feces, respectively, along with histological observation. The contents of Cd, Pb, Fe and Mn in the air of the most highly polluted area were 3-4 times larger than the others, for instance, Pb 0.292 vs. 0.091 microgram/cu m. The total contents of all metals were significantly higher in rats reared in the highly polluted area. The increase in the metal contents was significant from the early stage of rearing in the highly polluted area. Numerous phagocytes were found in the stroma under the pleura, in cellular cavities, in bronchi, and around the blood vessels in rats reared in the highly polluted area, but not in those reared in less polluted areas.

61378 **APTIC NO. 84510**

Ishinishi, Nobutomo, Yasushi Kodama, Eizaburo Kunitake, Koichi Nobutomo and Yasumasa Fukushima

CAUSAL RELATIONSHIP BETWEEN BENZO(A)PYRENE AND LUNG CANCER. *Benzo(a)pyrene to haigan). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(6):770-778, 1976. 28 refs.*

Experiments demonstrating the lung carcinogenicity of iron dusts collected from the Cottrell apparatus of an open hearth furnace with benzo(3-4)pyrene, both continuously injected into the bronchi of Wistar king rats of both sexes are described. The iron dusts were well washed with acetone to remove attached organic carcinogens and suspended in sterilized physiological saline at 7.5 mg/0.2 ml; the suspension was directly introduced into the trachea of 15 ether-anesthetized rats, 0.2 ml/rat/week for 15 weeks. A mixture of the iron dust and benzo(3-4)pyrene (7.5 mg + 0.1 mg/0.2 ml), and some benzo(3-4)pyrene (0.1 mg/0.2 ml) were administered to another group of rats. After observing the rats for their lifetimes it was confirmed that lung cancer was induced in the rat lungs, mainly consisting of squamous epithelial carcinoma, and that iron dusts and benzo(3-4)pyrene showed synergistic action on carcinogenesis. The most abundantly and broadly distributed carcinogenic hydrocarbon, benzo(3-4)pyrene, should be kept under the most strict watch among air pollutants. According to the present findings, iron dusts from open hearth furnaces containing nickel and chromium as well as iron should be watched most carefully.

61379 **APTIC NO. 84674**

Isomura, Kimio, Osamu Fukase, and Hiromu Watanabe

EFFECT OF OZONE ON GROWTH ACTIVITY OF ALVEOLAR MACROPHAGES. *(Ozone no haiho macrophage zoshokuno e no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 11(1):39-43, 1976. 12 refs.*

The recovery of alveolar macrophages after reduction of function due to ozone exposure was studied. Macrophages were removed from ozone-exposed male rabbits (1.0 and 2.7 ppm for 3 hr, or 1.0 ppm for 3 hr/day for 7 days). The alveolar macrophages removed from the intact male rabbits were cultured in vitro after exposure to ozone at 2.0 ppm. The number of alveolar macrophages removed from the ozone-treated rabbits showed no difference among the ozone exposed groups or the control animals. However, after removing and culturing, the number decreased in proportion to the concentration of ozone (there was still no difference between single exposure and repeated exposure to 1 ppm). The reduction persisted for more than 7 days. The frequency of macrophage cell division was reduced by ozone exposure. The reason for the absence of accumulative effects of repeated exposure to ozone might be extra-alveolar compensation after the daily damage.

61380 **APTIC NO. 84640**

Kawai, H., R. Endo, and K. Takemoto

RELATION BETWEEN THE DEGREE OF LUNG CONTAMINATION DUE TO AIR POLLUTION AND VARIOUS METALS. PART 2. *(Taikiosen ni yoru hai- osendo to kakushu kinzoku no kankei (II)). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), 31(1):161, April 1976.*

The lungs of 504 pigeons (70 in Koto, 17 in Sumida, 32 in Taito in Tokyo, 147 in Tsurumi, 45 in Kawasaki in Kanagawa, 111 in an unpolluted area, and 82 in Seoul, South Korea) were histopathologically examined for contamination and the contents of the metals iron, copper, magnesium, zinc, cadmium, nickel, cobalt, lead, chromium, and calcium determined. The metals that increase in the pigeon lungs with increasing degree of contamination are Cd, Ni, Pb, and Cr, especially Cr and Ni. Lead showed no local difference, probably due to its short persistence in the lung owing to its solubility in body fluid.

The metals Fe, Ca, and Mg showed no relationship to lung contamination. The metal found most abundantly in the lungs of pigeons collected in the industrially polluted areas (frequently more than 3 micrograms/g of dry matter) was Cr. Because of the simple structure of the nasal cavity, floating dust with Cr deposited in the pigeon lungs in a short time. It will be relatively easy to determine pollution sources by determining the metal content of pigeon lungs because of the high content of harmful metals such as Ni and Cr in the floating dust.

61381 **APTIC NO. 84515**

Kawai, Kiyoyuki

INHALATION CARCINOGENESIS IN AIR POLLUTION STUDY. A BRIEF REVIEW. *(Taikiosen to gangensei-BaP o chusin to shite-kyunyu- jikken ni yoru kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(6):758-762, 1976. 19 refs.*

Published data on long term inhalation experiments using single factors, compound factors, and mixed factors potentially causing carcinoma are reviewed. The findings indicate that even at 50 mg/cu m, inhaled benzo(3-4)pyrene showed negative results and that it is very difficult to cause carcinoma by inhalation of single air pollutants. The findings indicate also that there is synergistic action with compound factors such as benzo(3-4)pyrene with sulfur dioxide and mouse influenza virus PR8 plus ozone or nitrogen dioxide. Experiments are described in which rats were exposed by inhalation to combustion products of heavy oil containing minute carbon-like particles plus benzo(3-4)pyrene, sulfur dioxide, and heavy metals such as vanadium, nickel, and chromium, causing abnormal proliferation of mucosal epithelium of the respiratory organs, which might imitate the very early stages of human lung cancer. The experiment was continued for a whole file of rats and the result showed more cases of malignant tumors than in a control, showing the probability of the contribution of combustion products of heavy oil to carcinogenesis of organs other than respiratory organs. The more important finding was that the abovementioned abnormal proliferation never appeared when minute carbon particles were removed from the combustion products.

61382 **APTIC NO. 84509**

Kawai, M., H. Toriumi, Y. Katagiri, and M. Tate

STUDIES ON INFANTILE EXPOSURE TO LEAD: RESULTS OF LEAD SURVEY ON CHILDREN OF THREE YEARS OLD PART 2. *(Shoni no namari bakuro ni kansuru kenkyu: Sansaiji no namari kenshin seiseki Part 2). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 31(1):120, April 1976.*

Urinalysis was carried out on 3-year-old children in Tajimi City (known for its pottery manufacture), where the chance of lead exposure seems to be frequent in contrast with children of the same age and their mothers in Gifu City. Coproporphyrin(CP), protein, and delta-aminolevulinic acid (ALA) were used for indices of lead. The positivity of CP of the children was generally far higher than that of mothers. A higher positivity of CP(7++) was noticeable in the children of Tajimi. The positivity of CP of children with parent(s) engaged in lead work was also high. The ALA value was the highest in the 3-year-old children in Tajimi City; the number of 3-year-old children with ALA more than 1.0 mg/dl was most numerous in Tajimi. Higher ALA values were found in children either of whose parents engaged in lead work. In the cases where protein in urea was negative, ALA values in three-year-old children in Tajimi was high. No correlation was found between CP and ALA. Although the confirmative decision depends on the lead content of the blood, the high positivity of CP and high frequency of abnormally high value of ALA in the children in Tajimi City suggest the effects of lead.

61383 **APTIC NO. 84519**

Kawaraya, Toshio

PHOTODYNAMIC BIOASSAY OF THE CARCINOGENIC HYDROCARBONS. *(Hatsugansei tankasuiso no seibutsugakuteki kensaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(6):753-757, 1976. 29 refs.*

The lethal activity of carcinogenic polynuclear aromatic hydrocarbons against Paramecium caudatum under ultraviolet illumination corresponds well with the degree of carcinogenicity of the aromatic hydrocarbons. This was examined on mixtures of polynuclear aromatic hydrocarbons and isolated materials from floating dust in air. The benzene extract of floating dust was fractioned into 20-22 fractions by column chromatography and the content of benzo(3-4)pyrene of each fraction was determined by ultraviolet spectrophotometry. It was found that lethal times 90 and 100 were higher when the content of benzo(3-4)pyrene in the fraction was higher, and that the lethal times was inversely proportional to the degree of carcinogenicity of known carcinogenic polynuclear aromatic hydrocarbons such as benzo(3-4)pyrene, benz(ghi)perylene, perylene, benz(a)anthracene, chrysene, and coronene. The tarry material extracted from floating dust in urban air showed stronger lethality, to P.c. about 10 times than that expected by the content of benzo(3-4)pyrene of the tarry material.

61384 **APTIC NO. 84014**

Kitabatake, M.

THE EFFECTS OF AIR POLLUTANTS ON PROVOKING EXPERIMENTAL ASTHMA IN GUINEA PIGS. PART 1. EFFECTS OF SULFUR DIOXIDE AND SULFURIC ACID MIST. *(Morumotto no jikken zensoku jakki ni oyobosu taikiosenbusshitsu no eikyo ni tsuite part 1. Aryusangas oyobi ryusan mist no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(5):700-711, 1976. 34 refs.*

Experimental asthma was induced in guinea pigs exposed to a mixture of sulfur dioxide (145 ppm) and sulfuric acid mist (1.89 mg/cu m), and to sulfuric acid mist alone (1.91 mg/cu m), by subsequent exposure to different species to albumin. The effects of sulfur oxides exposure on provoking asthma and on the severity of asthmatic attacks were studied by comparison to guinea pigs exposed only to different species of albumin. The gaseous mixture more strongly accelerated experimental asthma than did the sulfuric acid mist alone. The respiratory passage susceptibility to acetylcholine was higher in the group exposed to sulfur oxides than in the control group. Repeated exposure to sulfur oxides in air accelerated airway sensitization, resulting in asthmatic dyspnea and increased hypersensitivity to acetylcholine.

61385 **APTIC NO. 84078**

Kitabatake, Masayoshi

ON THE EFFECTS OF AIR POLLUTANTS ON PROVOKING EXPERIMENTAL ASTHMA IN GUINEA PIGS. PART 3. EFFECTS OF NITROGEN MONOXIDE AND NITROGEN DIOXIDE. *(Morumotto no jikken zensoku jakki ni oyobosu taiki osen busshitsu no eikyo ni tsuite Part 3. Issanka chisso oyobi nisanka chisso no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(5):718-721, 1976. 10 refs.*

Guinea pigs were exposed to nitric oxide at 5.02 ppm or to nitrogen dioxide at 5.00 ppm, and then sensitized by inhalation of different species of albumin. After repeating these procedures they were compared to a control group sensitized only by albumin inhalation. It was confirmed that either nitric oxide or nitrogen dioxide accelerated experimental asthma. After examination of guinea pigs treated by a combination of exposure to nitric oxide and nitrogen dioxide and different species of albumin, it was found that air way hypersensitivity was greater than in those sensitized only by albumin. Thus it was demonstrated that the inhalation of nitric oxide induced experimental asthma and air way hypersensitivity in the same fashion as did nitrogen dioxide.

61386 **APTIC NO. 83681**

Konno, K. and K. Oizumi

PULMONARY FIBROSIS FROM THE VIEWPOINT OF ETIOLOGY. *(haisenisho, byoinron teki tachiba kara). Text in Japanese. Gendai Iryo (Mod. Med. Treat.), 8(2):99-105, 1976. 62 refs.*

The etiology of pulmonary fibrosis is described, citing many medical reports on diffuse stromatal fibrous pneumonia. Causes of the disease include the inhalation of gases, such as ozone and nitrogen dioxide, which cause acute alveolar septal edema followed by bronchiolitis obliterans and fibrosis; the inhalation of inorganic dusts such as particles of silica, asbestos, aluminum, and beryllium; and the inhalation of organic dusts containing bacteria, actinomycetes, and excretions of domestic animals and fowls which act as antigens, causing inflammation of the alveolar septum and then fibrosis. Antigen-antibody reactions triggered by microorganisms in organic dusts are discussed in detail.

61387 **APTIC NO. 84648**

Kumagaya, M., F. Hijikata, T. Nishinari, S. Izumi, H. Suzuki, H. Tajima, and A. Noto

RESULTS OF SURVEY ON THE DISEASES HAVING RELATIONSHIP TO AIR POLLUTION, IN AKITA PREFECTURE, PART I (1972 FISCAL YEAR). *(Akitaken ni okeru taikiosen kanrenshikkan chosa Part 1). Text in Japanese. Akitaken Ishikai Zasshi (Akita Med. J.), 28(1):1-21, June 1976.*

In Akita Prefecture, where no definite sources of severe air pollution yet exist, reports of pollutant-caused diseases were assembled from medical organizations in 18 cities, towns, and villages on a total of 2372 patients (about 62% consisting of children younger than 10 and elderly persons older than 50) who were treated during September 1972, the diseases chosen being, chronic bronchitis (CB), bronchial asthma (BA), chronic pulmonary emphysema (PE), asthmatic bronchitis (AB), diffuse pulmonary fibrosis (PF), chronic follicular conjunctivitis (FC), allergic conjunctivitis (AC), and allergic rhinitis (AR). On the whole, no definite relationship was found between the morbidity of these diseases and the concentration of air pollutants such as sulfur oxides, dust fall, and floating dust. However, locally, cases which suggest a relationship between the diseases and dust and special chemicals were found in a few towns. Conversely, the morbidity was not high in Akita City where the frequency of reports of dust, smoke, and exhaust was relatively high.

61388 **APTIC NO. 84679**

Kusumoto, S.

COMPARISON OF PHYSIOLOGICAL ACTIONS ON LIVING BODY OF PHOTOCHEMICAL OXIDANT AND OF OZONE. *(Kokagaku oxidant to ozone no seitai sayo no hikaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 11(1):56-57, 1976.*

Damage symptoms due to photochemical oxidant in Japan characteristically occur at lower concentrations than in Los Angeles. To study the possibility of other causal materials, an experiment was carried out on the symptoms of mice exposed to artificial photochemical oxidant and ozone. Male mice of the JCL-ICR strain, 3-5 weeks old, were exposed to the two pollutants for 3 hr, and several parameters were determined. Effects on white blood cells, WBC index, RBC, and 2,3-diphosphoglyceric acid were greater after exposure to the oxidant. Serous cholesterol and urea-nitrogen were affected more by ozone. The temperature in the colon of animals exposed to artificial oxidant showed the same elevation as was observed in victims of natural photochemical smog; however, that of animals exposed to ozone showed a decline. No change of other physiological parameters was found in animals exposed either to oxidant or to ozone. When these data were compared to the symptoms and clinical examination data of persons injured by photochemical smog, the data on animals exposed to artificial oxidant conformed better than the data on animals exposed to ozone. The cause of more severe injury in actual cases was due not to ozone alone, but to combination of ozone with other harmful substance(s), at lower concentrations than in the animal experiments. Animals administered a neurotropic drug were exposed to artificial oxidant. Their WBC and WBD index showed a remarkable increase, indicating that a reduction of autonomic nervous function is a cause of aggravating symptoms due to photochemical oxidant.

61389 **APTIC NO. 84576**

Makino, K., I. Mizoguchi, K. Yamada, J. Sakuma, H. Terao, T. Okino, and M. Yamamoto

MULTIVARIABLE ANALYSIS OF AIR POLLUTION AND SUBJECTIVE SYMPTOMS 1. *(Taikiosen to jikakushojo no tahenryo taiseki dai-1-po). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 31(1):171, April 1976.*

In order to determine which meteorological factors combined with air pollution affect subjective symptoms, self-recording of subjective symptoms in diaries was carried out by 150 freshman high school boys in a school in Ota Ward, Tokyo, from June 2 to July 5, 1975. The number of symptoms was 15, and meteorological records and air pollutant data were taken in the school. The relationship between each index was shown on a rectangular coordinate. From the results of multivariate analysis, analysis of correlation between the indices of pollutants and meteorological factors, and analysis of the subjective symptoms, it was clear that the correlation between acute symptoms such as headache, irritation of eyes and throat, and coughing and air pollutants such as ozone and sulfur dioxide, and the P-index(Babcock) was significantly high. Carbon monoxide and nitrogen oxides may act secondarily via the generation of oxidant rather than directly.

61390 **APTIC NO. 84652**

Matsubara, Sumiko

LET US LOOK AT OUR ENVIRONMENT AGAIN. EPIDEMIOLOGY OF ENVIRONMENT AND HEALTH. *(Wareware no kankyo o minaoso. Kankyo to kenko no ekigaku). Text in Japanese. Mainichi Life (Daily Life), 7(9):94-102, Aug. 1976. 5 refs.*

Health injuries due to several environmental pollutants are described. The role of epidemiology in cancer research is described. The study of the effects of environmental pollutants on populations needs an enormous amount of information. The dynamic state of pollutants in the food chain, the dynamic state of pollutants in human bodies, and the dose-response values of the pollutants are needed. For the study of carcinogenicity, air pollutants are divided into five major categories: the lung- stimulants such as sulfur oxides, nitrogen oxides, ozone and chlorine; the dusts, such as silica, carbon, and iron oxide; the granuloma causing-substances, represented by beryllium; the pyrexia causing substances such as zinc and manganese, and the suffocating substances such as carbon monoxide and hydrogen sulfide.

61391 **APTIC NO. 84525**

Mitobe, H., E. Hasebe, and T. Hirose

PRESENT STATE OF AIR POLLUTION IN SENDAI-SHIOGAMA AREA. PART 2. THE RESULTS OF LUNG FUNCTION EXAMINATION. *(Senenchiku ni okeru taiki osen no genkyo. Part 2 Haikinokensa seiseki o chushin ni shite). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan J. Thoracic Dis.), 14(3):158, 1976.*

A mass examination of respiratory function was carried out among inhabitants of Tagajo, with Ishikawa city as a control. Abnormalit was found in people in their forties in the Maruyama area of Tagajo. In boys in the area a small reduction of lung function was indicated. No statistically significant reduction was found in girls. The sl findings show the existence of respiratory disturbance due to air pollution in the Sendai-Shiogama area.

61392 **APTIC NO. 84590**

Mitsunaga, K. and H. Watanabe

EXAMINATION OF IMMUNOSEROLOGICAL CHANGES DUE TO AIR POLLUTION. *(Taikiosen ni yoru menekikesseigakuteki henka ni kansuru kento). Text in Japanese. Kogai Kenkyu Nenpo (Annu. Rept., Tokyo Metropol. Res. Lab. Environ. Pollut., vol. 1976:223-225, July 1976.*

An examination for immunoserological changes was carried out on 40 residents in a polluted area of Koto Ward neighboring a fertilizer factory and 22 persons in an unpolluted area of Tama City, both in Tokyo, following the same examination in 1973 and 1974. Subjects were classified by age with equal numbers of each sex. Serum, total protein content, serum immuno globulin (gamma G and M) content, alpha-antitrypsin (a-1-AT), RA test, antistreptolysin O value (ASLO), and mycoplasma-implement binding reaction were studied. Serum total protein content was in the normal range in both areas, indicating that both groups were appropriate subjects of immunoserological studies. Average values of immunoglobulins (gamma-G,A,M) and a-1-AT were all in the normal ranges. The number of persons positive in RA tests was higher in the Koto area, and distributed in younger people as in 1974, suggesting the potential existence of immunological abnormality due to factors other than aging.

61393 **APTIC NO. 84572**

Mori, S., T. Izumi, K. Taira, and M. Aizawa

ENVIRONMENTAL POLLUTION SEEN FROM TRAFFIC VOLUME (II). CASES IN SAGA CITY PART 2. LOCAL INHABITANTS RESPONSE TO ENVIRONMENTAL POLLUTION. *(Sharyokotsuryo kara mita Kankyoosen (II). Sagashi no baai Part II. Kankyoosen ni taisuru chiiki jumin Hanno). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 31(1):167, April 1976.*

Local inhabitants response to environmental pollution in a busy area and a residential area and the concentration of carbon monoxide of inhabitants expired air were investigated in Saga City. The environmental concentration of carbon monoxide was on the average (24 hr) 8.0 and 2.4 ppm, respectively, in the busy area and in the residential area. Those in expired air of non- smokers were on the average 7.5 and 5.8 ppm, respectively, in the busy area and in the residential area, reflecting well the environmental pollution. The complaints of inhabitants were headache (34.7 and 13.6%), anorexia (19.6 and 4.3%), fatigue (49.6 and 17.9%), disturbances of nasal respiration (20.2 and 7.9%), coughing and sputum (29.1 and 8.2%), and susceptibility to cold (40.0 and 16.1%), the percentages being the number of inhabitants complaining of the symptoms in the busy and residential areas. The busy area is a commercial zone in the city around the intersection of National road No. 34 and the main local road which carries heavy traffic; the peak concentration of carbon monoxide is 11 ppm (average from 8 am to 8 pm).

61394 **APTIC NO. 83193**

Morimoto, T. and T. Ishii

AIR POLLUTION AND HEALTH OF CHILDREN WITH RESPIRATORY DISTURBANCES IN SHINJUKU WARD, TOKYO. *(Taikiosen to jumin no kenko, Tokyoto shinjuku-ku no kokyushogaiji). Text in Japanese. Koshu Eisei Joho (Public Health Inform.), 6(2):19, Feb. 1976.*

Asthmatic diaries were kept by 135 asthmatic children during Oct. 1973 - Nov. 1974 in Shinjuku Ward, Tokyo. The frequency of asthmatic fits, meteorological conditions, and other factors were analyzed for the 76 diaries that were used. The instances of fits of bronchial asthma and asthmatic bronchitis numbered 58 and 6, respectively, for 35 boys and 23 girls under age 15. It was concluded that the major precipitator of asthmatic fits was meteorological conditions accompanied by catching cold.

61395 **APTIC NO. 84530**

Morise, M., N. Nishiwaki, O. Takanou, J. Hattori, K. Ito, N. Mizutani, and M. Iwakura

PROGNOSES OF PATIENTS OFFICIALLY APPOINTED TO BE DUE TO AIR POLLUTION AND THE HYPERSENSITIVITY OF THEIR AIRWAYS. *(Kogai nintei kanja no yogo to kido-kabinsei). Text in Japanese. Arerugi (Japan J. Allergy), 25(4):254, April 1976.*

Thirty nine cases of bronchial asthma officially due to environmental pollution (mainly thought to be air pollution) in Yokkaichi were reported, with the first occurrence after the operation of the No. 1 Combination, were reported. They consisted of 20 men and 19 women, with a small number of the atopy type and a large number of the infectious type, and mostly older than 50. Airway hypersensitivity was determined by the percentage of reduction of 1-second volume after inhalation of 1000 micrograms of acetylcholine. Their prognoses consisted of 11 cases of improvement and 28 cases without improvement and at the time of beginning observation, no significant difference was seen in the percentage of reduction of 1-second volume between those improved and not improved. However, after 4 years of observation, the percentage of reduction of 1-second volume significantly decreased in both groups of patients (improved and not improved). That is, the airway hypersensitivity decreased, noticeably, especially in 6 of 7 cases which showed remission.

61396 **APTIC NO. 83253**

Motomiya, T.

EFFECTS OF NITROGEN OXIDES ON LIVING BODY. *(Chisso sankabutsu no seitaieikyo). Text in Japanese. Rinsho Eiyo (J. Nutrition), 48(2):108, Feb. 1976.*

The effects of nitrogen dioxide and nitric oxide on the human body are summarized. The major biological properties of nitrogen dioxide are its ability to penetrate deeply into the bronchioles and alveoli, resulting in chronic bronchitis with proliferation of peripheral epithelial cells and dilatation of alveolar cavities. Nitrogen dioxide could be the cause of obstructive respiratory disturbances. Nitrogen dioxide reduces immunological resistance against pulmonary infection, as shown by redued phagocytosis of alveolar phagocytes, degeneration of the alveolar surface, reduction of alveolar cellular respiration, accentuation of membrane-permeability, and changes of enzymatic activity. Air pollution by nitric oxide is higher than that by nitrogen dioxide in several areas; however, as it is oxidized to nitrogen dioxide, experiments with only nitric oxide have hitherto been technically difficult. The formation of NO hemoglobin and its general affects, especially on the nervous system and cardial muscles, is discussed.

61397 **APTIC NO. 80542**

Murthy, V. K.

REALISTIC MODELS FOR MORTALITY RATES AND THEIR ESTIMATION. *California Univ. at Los Angeles and Southern California Univ., Los Angeles, Environmental Protection Agency Grant 800230, Program Element 1AA601, Rept. EPA-600/1-76-015, 104p., Feb. 1976. 35 refs.*

Mathematical models are presented which, as special cases, represent constant, increasing, and decreasing mortality rates, along with combinations of these properties. Usually these mortality rate curves are U-shaped. The first part of the curve corresponds to infantile mortality, the second part corresponds to useful life, and the last part ccorresponds to aging, culminatin in death. Their corresponding probability distributions and survivorship functions are obtained in closed form. Methods of estimating the parameters are developed and procedures dealing with computational details and statistical properties are discussed. These methods can be applied to assess the marginal detrimental effect of any designated pollutant on the mortality rate in the presence of other competing risks. (Author abstract modified)

61398 **APTIC NO. 83883**

Nakamura, T. and T. Tachiki

CHRONIC DISEASES OF RESPIRATORY SYSTEM, CENTERING ON CHRONIC PULMONARY EMPHYSEMA. *(Mansei kokyuki no shikkan, mansei haikishu o chushin to shite). Text in Japanese. Mod. Med. Japan, no. 48: 78-88, Feb. 1976.*

The meaning and usefulness of the term obstructive is discussed. A new diagnostic method, selective alveolo bronchography, is described. Small air-way disease is discussed. The etiology of chronic air-way diseases: factors such as smoking, air pollution, infection of the upper air-way, nutrition, predisposition, and age are discussed. The mechanism of the diseases, senility, air-way pathological changes due to long-term stimulation caused by air pollutants, and the impairment of ciliary action and air-way circulation are described. The importance of early preventive medical examination is stressed. The present morbidity and mortality, the natural history of the diseases, and secondary prevention are described.

61399 **APTIC NO. 84577**

Nobutomo, K., S. Ishinishi, and C. Nakashima

FACTOR ANALYSIS OF CONTINUED COUGHING AND SPUTUM. *(Jizokusei seki tan no yoin bunseki). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 31(1):72, April 1976. 1 ref.*

Following the guidelines of Fletche continued coughing and sputum were included in chronic bronchitis and etiological screening was carried out by the BMRC method. The total population of those more than 40 years old living for more than 3 years in the areas A and B neighboring the Oita coastal industrial zone (1193 persons) and a control population of 428 persons living in a rural area was surveyed. Dust fall, sulfur trioxide, sulfur oxide, nitrogen dioxide and floating dust were chosen as air pollutants. The results of the etiological analysis were: no sexual difference could be found, there are areas where age was the significant factor, smoking habit was as expected, a strong factor, respiratory disease history was a strongly significant factor, history of injury by harmful gas was the significant factor in some areas, the difference of living location was significant and the occupational history of exposure to harmful gas or dust was not a significant factor in the morbidity of continued coughing and sputum.

61400 **APTIC NO. 84588**

Noushi, H., I. Mizoguchi, K. Akiyama, R. Takahashi, C. Nagashima, M. Nagasaki, and T. Nakajima

TREND OF LEAD IN THE BLOOD AND URINE IN INHABITANTS OF TOKYO. *(Tomin no kecchu, nyochu namari no doko). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 31(1):160, April 1976.*

Since the occurrence of heavy lead pollution in Tokyo in 1970, a medical survey on lead has been made by 50 local health centers for the last 5 yr. The results of the survey were collected and analyzed in time course. The general trend indicated that the lead content of blood and urine and delta-aminolevulinic acid in the urine of Tokyo citizens showed a yearly decrease with P less than 0.001. When the individual data, 2282, 1955, and 2057 samples, were classified by areas as commercial, commercial- industrial, industrial, and residential, the lead content of blood was largest in industrial populations followed by commercial and then by residential areas, throughout the 5 yr. Lead in urine was higher in the commercial-industrial area than in the residential area. Delta-aminolevulinic acid was higher in industrial areas than in commercial and residential areas. In 1974, the difference in determined values in different areas almost disappeared, lead in blood being 9.5 + or - 4.9 microgram/100 g in the commercial area, 9.2 + or - 4.1 microgram/100 g in the industrial area, and 7.1 + or - 3.7 microgram/100 g in residential areas. Delta aminolevulinic acid was 2.57 + or - 0.71, 1.89 + or - 0.73, and 1.71 + or - 0.72 mg/l respectively, in the industrial, residential, and commercial areas. These have decreased with time, probably due to the regulation of leaded gasoline since 1971.

61401 **APTIC NO. 84578**

Nukada, A.

FACTOR ANALYSIS OF INFANTILE RESPIRATORY DISEASES CONCERNING AIR POLLUTION. *(Taikiosen ni kakawarushoni no kokyuki shikkan ni kankeisuru yoin bunseki). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 31(1):173, April 1976.*

From the descriptions on 2000 applications for subsidizing medical expenditure on health disturbances due to air pollution in Ota Ward, Tokyo for the past 3 years, the residence, disease(s), medical organization, age, age of patients at onset of disease, and symptoms were analyzed according to the theory of quantitization of the 3rd category by Hayashi. The relationship between the frequencies of the abovementioned factors was well explained by the spatial arrangement with two axes, one of which represents the name of the disease such as asthmatic bronchitis and bronchial asthma, the other representing the medical organizations such as local medical center, private hospital, or university hospital. For instance, patients younger than five years who had common colds with stridor when they were younger than 2 years old were diagnosed as asthmatic bronchitics by a local medical center. The disease state and the name of the disease do not necessarily depend on the local degree of air pollution but also on the age of the patients, the distance between the patient's residence and the medical organization, and the geographical distribution of the organizations.

61402 **APTIC NO. 84083**

Okamoto, T. and T. Meguro

LUNG FUNCTION OF CHRONIC BRONCHITIC PATIENTS IN AIR-POLLUTED AREAS AND NON-AIR-POLLUTED AREAS CENTERING ON FLOW-VOLUME CURVES. *(Taiki osenchiku to hiosenchiku no mansei kikanshien no haikino flow-volume kyokusen o chushin to site). Text in Japanese. Okayama Igakai Zasshi (J. Okayama Md. Soc.), 88(1-2):119-124, 1976. 14 refs.*

A survey of the morbidity of respiratory diseases in 1433 inhabitants of air polluted areas of Mizushima in Kurashiki City, and of 568 inhabitants of non-polluted areas in the same city are described. Ages were between 40 and 69. The findings in 1973 were: (1) the percentage of complaints of respiratory diseases was higher in polluted areas, as in 1972, than in non-polluted areas; (2) the results of lung function examination showed no difference in spirometry between the areas; however, PF V 50 and V 25 were lower and V 50/V 25 was higher in air- polluted areas than in non-polluted areas; (3) there was a tendency to declining lung function shown in flow-volume curves for people in their fifties in air-polluted areas; this was more prominent for chronic bronchitic patients and more conspicuous in air-polluted areas than in non-polluted areas.

61403 **APTIC NO. 84082**

Okura, H.

INTOXICATION DUE TO TETRAALKYL LEAD. *(Tetraalhyl namari chudoku). Text in Japanese. Gendai Kagaku (Mod. Chem.), no. 61:61-65, April 1976.*

The general composition of commercial tetraalkyl leads, the physical properties, and the LD(50) are discussed. Subjects were exposed to 15 mg/kg tetraethyl lead and 17.3 mg/kg tetramethyl lead. The first major symptoms of tetraalkyl lead intoxication were congestion of the bulbar conjunction, pain the eyes, a tearing pain in the nose, dizziness, vomiting, and headache. The toxic action was exhibited in the body in the course of degradation to trialkyl- dialkyl-, and inorganic lead. The carcinogenecity of tetraalkyl lead (leading to malignant lymphoma) is described.

61404 APTIC NO. 83552

Petraglia, A., O. Tarantino, C. Caso, and G. De Cataldis

RELATIONSHIPS BETWEEN ATMOSPHERIC POLLUTION AND RESPIRATORY SYSTEM. *(Rapporti fra inquinamento atmosferico ed apparato respiratorio). Text in Italian. Minerva Med., 67(6):406-410, Feb. 4, 1976. 9 refs.*

The close relationship between environmental pollution and the respiratory system is discussed. The various polluting compounds from solid particles to fumes and gases are reviewed. Emphasis is placed on sulfur and nitrogen compounds, asbestos, and radioactivity. The complexity of the air pollution problem in relation to respiratory pathology is stressed.

61405 APTIC NO. 84279

Rosmanith, Jindrich, Hans Joachim Einbrodt, and Werner Ehm

INTERACTIONS BETWEEN LEAD, CADMIUM AND ZINC IN CHILDREN FROM AN INDUSTRIAL AREA. *(Zu Interaktionen zwischen Blei, Cadmium und Zink bei Kindern aus einem Industriegebiet). Text in German. Staub, Reinhaltung Luft, 36(2):55-62, Feb. 1976. 94 refs.*

Children who were subject to simultaneous low-level exposure to lead, cadmium, and zinc were studied. The values for lead, cadmium, and zinc in the hair and for zinc in the urine rose with increasing blood lead levels, while the cadmium concentration in blood and urine and renal excretion of d-ALA decreased. Thus it appears that the degree of lead uptake alters the behavior of cadmium and zinc in the organism. An increased lead uptake induces increased cadmium retention, and leads to a redistribution of zinc in the body.

61406 APTIC NO. 84585

Saito, K., I. Takada, H. Kondo, S. Takehara, and T. Okino

ON THE RESULTS OF MEDICAL EXAMINATION OF INHABITANTS AS TO EFFECTS OF ENVIRONMENTAL POLLUTION. PART I. *(Kogaiteki Yoin ni yoru Eikyo Chosa to shite no Jumin Kenshin no Kekka ni tsuite. Part I). Text in Japanese. Shikoku Koshueisei Gakkai Zasshi (J. Shikoku Soc. Public Health), 21(1):99-105, Feb. 1976. 2 refs.*

Two instances of medical examination of inhabitants regarding environmental pollution are described. Rhinitic examination of schoolchildren in the Anami area and the examination of the effects of chromium on inhabitants around a chromium refinery in Fukushima City are described. About 6000 children in primary, middle, and high schools were medically examined. Except for one school, no significant difference of the morbidity of rhinitis was found among children in different schools. In this one school, there was more severe thickening of nasal mucosa and excess of nasal discharge. Urinalysis of 32 inhabitants around the refinery, and of 42 controls and 30 workers in the refinery, showed average chromium contents of 0.0139 (0.095-0.002), 0.0053 (0.017-0.001) and 0.0179 (0.114-0.0035) ppm, respectively, in February-June 1975. The average content of total chromium in the air around the refinery was 0.0000 mg/cu m in 1973 and 1974, the hexavalent chromium not being detected (detection limit: 0.0000 mg/cu m).

61407 APTIC NO. 84641

Sasaki, K.

SURVEY ON AIR POLLUTION DUE TO MOTOR TRAFFIC SEEN FROM THE DEGREE OF CONCERN WITH HEALTH. *(Kenko ni tsuite no kanshindo yorimita kotsukogai chosa). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 31(1):178, April 1976.*

The degree of personal concern with the affect on personal health of motor traffic was surveyed in 295 people (male 43%, female 57%) who attended an enquete survey and underwent mass medical examination. The percentages of those having strong concern, those having some concern, and those having no concern were respectively 36, 42 and 22. The percentage of those complaining about subjective symptoms among the abovementioned groups was respectively, (33.4 in men, 33.1 in women), (20.9, 23.2), and (16.1, 13.5). The percentage of complaints about environmental pollution including the effects on plants (63.5, 62.5), (45.7, 51, 6) and (39.6, 32.6). The percentages of those complaining about environmental pollution was higher as the percentage of complaints about subjective symptoms increased. The relationship between the clinical findings with regard to internal medicine and otorhinolaryngology and the concern with health was significant in the first group of persons.

61408 APTIC NO. 84594

Seki, Hideo

STUDY ON BIOLOGICAL PARAMETERS FOR LEAD EXPOSURE, ESPECIALLY FOR LOW-LEVEL LEAD EXPOSURE. *(Namari bakuro no seitai shihyo ni kansuru kenkyu). Text in Japanese. Nihon Daigaku Igaku Zasshi (Japan Univ. Med. J.), 35(3):239-245, 1976. 10 refs.*

A study of the disturbance of biological functions due to exposure to lead in low levels was undertaken. Blood lead levels (Pb-B), delta-aminolevulinic acid dehydrase in erythrocytes in peripheral blood (ALA-D), and urinary delta-aminolevulinic acid levels were determined in 30 rural residents (A), 32 city residents (B), and 20 lead-handling workers (C) with moderate exposure to lead. The results were: (1) Pb-B was 8.3 + or - 1.3, 12.8 + or - 2.0, and 26.0 + or - 2.0 microgram/dl in A, B, and C, respectively. (2) ALA-D was 24.5 + or - 40, 199 + or - 40, and 134 + or - 43 n mole PBG/ml RBC/30 min, respectively. (3) ALA values were higher only in lead workers. The correlation between Pb-B and ALA-D was only significant in group C; however, it was inversely significant when A, B, and C were calculated together. The threshold value of Pb-B was nearly 15 microgram/dl, over which a significant inverse correlation was found between Pb-B and ALA-D. Although urinary ALA was less sensitive than ALA-D to changes in the lead parameter, it was useful for lead workers. Health disturbances due to lead would not be generally recognized in the population at large.

61409 APTIC NO. 84536

Shimizu, H. and K. Aoki

EPIDEMIOLOGICAL CONSIDERATION BETWEEN AIR POLLUTION IN BROAD AREA AND LUNG CANCER. *(Koiki Taiki Oscn to haigan no ekigakuteki kosatsu). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), vol. 1976:123, 1976.*

An epidemiological study of the relationship between lung cancer and sulfur dioxide is reported. The mortality by lung cancer from 1967 to 1972 in Nagoya and Yokkaichi, both highly air polluted, was 11.7 and 11.6, respectively, a little higher than that in all Japan (10.2/100,000 people). In Ise City, where air pollution has never been recognized, it was as high as 12.4. No relationship between mortality and sulfur dioxide concentration was found in these 3 cities. No result indicating a strong relationship between lung cancer and local differences of industrialization could be observed. In Tokyo, Osaka, and Nagoya where industrialization has developed, the deaths of people over 40 were moderate to low. There was no relationship between lung cancer and air pollution. The results of a survey in Ise City showed a high occurrence of lung cancer different from the epidemic type.

61410 **APTIC NO. 84524**

Shimizu, K., M. Harada, M. Miyata, S. Ishikawa, and I. Mizoguchi

EFFECTS OF PHOTOCHEMICAL SMOG ON HUMAN EYE. (Kokagaku smog no me ni oyobosu eikyo ni tsuite). Text in Japanese. Rinsho Ganka Clin. Ophthalmol.), 30(4):19-30, 1976. 14 refs.

An epidemiological study of the affects of photochemical smog on the human eye during May 20-July 19, 1974; biochemical studies of pH and lysozymal activity in tears, and an experimental study on exposure of human and animal eyes to gaseous acrolein were carried out. The existence of ocular injury due to photochemical smog was confirmed epidemiologically, the most sensitive subjective symptom being pain in eyes. Even in cases in which almost no subjective symptoms were recognized, significant reduction of pH and lysozymal activity of smog patient s tears was found in field examinations. Exposure of human eyes to 0.5% acrolein gas revealed very large individual differences in ocular irritation. When rabbit eyes were exposed to 10% acrolein gas for 2 hr, opacity which resembled spotlike superficial keratitis occurred locally in the central part of the cornea; the use of a scanning electron microscope revealed that the opacity was the result of destruction, fall out, and a membrane-like component of 2-3 layers of corneal epithelial cells. Morphological change appeared on corneal epithelium after exposure to gaseous acrolein.

61411 **APTIC NO. 84514**

Shimizu, Tadahiko

LUNG CANCER MORTALITY AND AIR POLLUTION IN OSAKA. *(Osaka ni okeru haigan shiboritsu to taikiosen). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(6):779-783, 1976. 6 refs.*

In Osaka Prefecture, local differences of mortality due to lung cancer were examined in connection with air pollution. The normalized mortality due to lung cancer in Osaka Prefecture during 1960-1969 was higher in more urbanized parts, the ratios of mortality being 1.4, 1.3, 1.2 and 1.0 in the city. In industrial areas, suburbs, and rural districts this tendency has been observed for males during 1960-1964, 1965-1967 and 1968-1969. The local differences of mortality due to lung cancer were larger than the values expected from the distribution of smoking among inhabitants; the difference between the actual and the expected values was higher in more urbanized parts. No relationship was recognized between concentrations of sulfur dioxide and mortality due to lung cancer of male inhabitants in Osaka by wards. A tendency was observed for mortality due to lung cancer to be higher in areas where the degree of air pollution due to motor vehicles is higher.

61412 **APTIC NO. 84644**

Sugiura, K.

ENVIRONMENTAL POLLUTION DUE TO MOTOR VEHICLES PART 4. CORRELATION BETWEEN POLLUTION DUE TO NITROGEN DIOXIDE AND ASTHMA. *(Jidosha niyoru kankyoosen Part 4. Nisankachisso osen to zensoku no sokansei). Text in Japanese. Preprint, General Research Society for Environmental Science, Japan, p. 60-61, 1976. (Presented at the Environmental Science Meeting, 2nd, Tokyo, Japan, June 4, 1976.)*

Results of a survey of primary schoolchildren (3rd year) with experience of asthma, including the concentration of nitrogen dioxide in homes (at the entrance) in 20 areas (cities, towns, and villages) in Saitama Prefecture in 1975 are summarized. The total number of schoolchildren, the number of children having asthmatic history, their ratio (%), the highest and average concentration of nitrogen dioxide, and the frequency (%) of exceeding the standard value was respectively, 46,627, 2254, 4.83%, 0.16 ppm, 0.023 ppm and 31.4%. In view of the less than 0.02 ppm NO2 standard, 31.5% of the determined values were higher than the standard. Sixteen areas are highly polluted by auto exhaust. The correlation coefficients between the percentage of asthma-experienced children and the concentration of NO2 (0.01, 0.02, 0.03, 0.04, 0.05 and 0.06 ppm) were respectively 0.67, 0.78, 0.67, 0.64, 0.42 and 0.40. The percentage of values in excess of 0.01-0.04 ppm and the percentage of asthma-experienced children was correlated (p less than 0.05). The above data and the already surveyed sulfur dioxide concentration in Saitama Prefecture indicate the contribution of sulfur oxides and nitrogen oxides to asthma.

61413 **APTIC NO. 84673**

Suzuki, U.

EFFECTS OF OZONE EXPOSURE ON BLOOD. *(Ozon bakuro ni yoru ketsueki e no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 11(1):54, 1976.*

The reduction of osmotic pressure resistance of SD strain rats just after exposure to ozone for 1 hr at 9 ppm (but not at 1 ppm) was observed. There were no significant differences of blood parameters such as RBC, Hematocrit%, hemoglobin, amount of SH-group, bilirubin, glucose, and cholesterol compared to a control. A significant reduction of activity of sodium ion/potassium ion - ATPase was observed in animals exposed to ozone (P 0.05). After continued exposure of Dutch rabbits to ozone at 1 ppm for 10 days, no change was observed in RBC, Hematocrit%, and MCV; however, hemoglobin, MCH, MCHC, glucose, and GPT-activity had higher values during and after exposure. The activity of GOT and LDT increased at the 7th day, while ALP decreased at the 6th day; however, all of these activities returned to the level of the control. The phenomenon of glycolitic enzyme activation with increased amounts of glucose in blood was observed also on rats exposed to ozone. Hormone mechanisms are discussed to explain the phenomenon.

61414 **APTIC NO. 84531**

Suzuki, Y., S. Sakurai, and F. Tsunoda

STUDIES ON AIR POLLUTION DUE TO FLUORIDES. PART 18. ON THE NORMAL CONCENTRATION OF FLUORINE IN JAPANESE BONES. *(Fakkabutsu ni yoru taikiosen ni kansuru kenkyu. Part 18. Nihonjinno kotsu-chu fusso nodo no seijo chi ni tsuite). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), 31(1):175, April 1976.*

Reports that high accumulations fo fluorine have occurred in the hard tissues of goats grown under conditions of air pollution from fluoride suggested the possibility of evaluation of physiological pollutions and of diagnosis of osteoscleorosis due to fluorine by analyzing the fluorine. The fluorine content of Japanese skeletons was taken as a standard. Fluorine was distributed relatively evenly in all bones. In persons older than 60 yr, the ash base fluorine content differed a little by position; however, in general, it was higher in men than in women, 1250-1500 and 850-1250 ppm, respectively. With age (older than 30), fluorine content showed a slowly increasing tendency.

61415 **APTIC NO. 84522**

Takayama, O., T. Suzuki, Y. Oshio, and K. Mochizuki

FOLLICLE-LIKE PROTUBERANCE OF THE CONJUNCTIVA AND THE LYMPHATIC TISSUE IN THE UPPER AIRWAY ON SCHOOLCHILDREN IN AIR POLLUTED AREAS. *(Taikiosenchiku ni okeru gakudo ketsumaku no rohoyo ryuji to jokido rimpasoshiki ni tsuite). Text in Japanese. Nihon Jibi Inkoka Gakkai Kaiho (Jap. J. Otorhinolaryngol Soc.), 79(4):520, April 1976.*

Awareness of a tendency of proliferation of lymph follicles on the posterior wall after long-term stimulation due to air pollutants led to an examination of the relationship between mucosal stimulation symptoms in the upper airway and ophthalmological stimulation symptoms on the same children. It was found that there is a tendency for conjunctival follicle-like protuberances and lymphatic follicle-like proliferation on the posterior wall of the pharynx to occur simultaneously. The examination was carried out on a day when no photochemical smog alarm was issued.

61416 **APTIC NO. 84592**

Takayama, O., Y. Oshio, and U. Ikematsu

STUDY ON THE POTENTIAL EFFECTS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASES, ESPECIALLY ON THE MORBIDITY IN UPPER AIRWAY. *(Mansei- heisokusei Hai-shikkan no senzaiteki eikyo chosa kenkyu; jokido no taido ni tsuite). Text in Japanese. Kogai Kenkyu Nenpo (Annu. Rept. Tokyo Metropol. Res. Lab. Environ. Pollut.), vol. 1976:225-231, July 1976.*

A clinical survey on morbidity of upper airway symptoms was carried out in 1975 (as in 1973 and 1974) in the polluted Koto area and in the non-polluted area of Tama, both in Tokyo. Subjects were divided into groups examined in summer and winter, and groups of adults and children. The method of survey consisted of microscopic examination of changes in the pharynx and larynx, and o sonagraphic examination on those complaining of husky voice. Adults and children in air polluted areas were more likely to suffer larynx symptoms than those in non- polluted areas, especially in summer. Adults in polluted areas were subject to symptoms of the pharynx and larynx. Husky voice tended to occur more often in polluted areas. A characteristic feature was separated tonal components in both the higher and lower registers.

61417 **APTIC NO. 84513**

Takemoto, Kazuo

PATHOLOGICAL CHANGE OF THE LUNG CAUSED BY AIR POLLUTION, ESPECIALLY ON THE PULMONARY CANCER. *(Taikiosen ni yoru hai no byohen, tokuni haigan ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(6):763-769, 1976. 11 refs.*

Remarkable recent increases of lung cancer in Japan, and possible causes are described. There are very few articles which concern the relationship between air pollution and lung cancer; several methods of studying the relationship are suggested. The pathohistological study of dog lungs is explained in detail. For lung contamination by air pollution, studies of pigeon lungs would be fruitful; however, tumorous change has never been discovered. Experimental results using mice injected with carbon particles with and without the addition of benzo(3-4)pyrene into lungs showed that the coexistence of the carcinogen and carbon powder caused tumorous changes where the powder was deposited. No single air pollutant such as sulfur oxides and nitrogen oxides has caused tumors even when mixed with known carcinogens. Occupational lung carcinogens such as nickel, chromium, and asbestos have come to be regarded as the important carcinogens existing as air pollutants for the general population.

61418 **APTIC NO. 84508**

Takeo, K., O. Wada, S. Ono, S. Nagahashi, Y. Yokoo, K. Ogishima, I. Noiri, and A. Ishikawa

PERIPHERAL ERYTHROCYTE DELTA-AMINOLEVULINIC ACID DEHYDRASE ACTIVITY IN EXPOSED PERSONS TO LEAD OF LOW CONCENTRATION IN THE GENERAL ENVIRONMENT. *(Ippan kankyoka teinodo namari bakurosha no massho sekkekyu delta-amino levulinic acid dehydratase kassei). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 31(1):121, April 1976.*

The reverse-correlation between the lead in the blood (Pb-B) and delta-aminolevulinic acid dehydrase activity (ALA-D) in the peripheral erythrocyte of lead-exposed persons was investigated in persons who were exposed to lead at low concentrations. The usefulness of ALA-D as the physiological index in the case of persons exposed to low lead concentrations was investigated. The subjects were 3 groups: 30 inhabitants living in the provinces north of Tokyo longer than 5 years (group 1); 32 citizens living in the metropolitan center for more than 3 years (group 2); and 20 leadworkers with moderate lead exposure without clinical symptoms (group 3). The items examined were Pb-B(micrograms/ml), ALA-D, and ALA in urine (mg/l.). A significant difference was found between the groups on the average Pb-B and ALA-D. Although there was no correlation between log (ALA-D), and Pb-B in groups 1 and 2, it was high in totalized groups 1 plus 2 and 1 plus 2 plus 3. In the reorganized group of Pb-B of over 10 micrograms/ 100 ml blood, a relatively clear reverse correlation was discovered. Considering these facts, the following conclusions were derived: there was no correlation between Pb-B and ALA-D in the general population with nonoccupational lead exposure; the correlation between Pb-B and ALA-D was found in persons with Pb-B over 15 microgram/dl; and genetic factors play a large role in determination of ALA-D activity in the general population, the environmental pollution due to lead being minor.

61419 **APTIC NO. 83798**

Tanizawa, Y.

EFFECTS OF FLUORINE COMPOUNDS ON MAN, AS AIR POLLUTANTS. *(Taikiosen butsu to shite no fukkabutsu no ningen e no eikyo). Text in Japanese. Rodo No Kagaku (Dig. Sci. Labor), 31(4):17-21, April 1976. 1 ref.*

Air pollution due to fluorine compounds has accompanied the increase of aluminum and phosphate fertilizer production. While plant damage due to airborne fluorine compounds has been widely publicized, human injury has not. Refrigerants, plastics, drugs and missile propellants are sources. In Japan the ambient fluorine concentration is 0.1-0.5 microgram F/cu m in larger cities and 0.1-0.3 microgram F/cu m in smaller cities. Epidemiological information on the effects of airborne fluorine compounds on humans is given, including results of medical examinations. Urinary fluorine, the frequency of macular teeth, the frequency of complaints of cough, sputum, and stridor, cases of osteosclerosis and of ECG findings, and thyroidal function disturbance, all of which indicate the degree of human injury due to fluorine, are described. The route of fluorine intake into the human body and the relationship of respiratory diseases such as chronic bronchitis, asthmatic bronchitis, bronchial asthma, and pulmonary emphysema to ambient fluorides around an aluminum refinery are described in detail.

61420 **APTIC NO. 84526**

Teraushi, Y., S. Takasaki, M. Hattori, and H. Mitsunusa

ON THE PRESENT STATE OF CHILDREN SUFFERING FROM BRONCHIAL ASTHMA IN CHIBA CITY. *(Chiba shi ni okeru kikanshizensoku ji no genjo ni tsuite). Text in Japanese. Hokenfu Zasshi (Japan. J. Pub. Health Nurse), 32(4):250-256, April 1976. 3 refs.*

The disease histories of 100 bronchial asthma patients younger than 18 whose disease is officially designated as due to environmental pollution were taken by public health nurses during 3 months beginning August 1, 1974. The patients consisted of 20 children in kindergarden, 51 primary schoolchildren, 9 middle school pupils, and 3 high school pupils. Their disease histories included rhinitis (52), eczema, and strophulus (52), urticuria (24), and otitis media (23). They visited a doctor 1-3 times/month on the average, and 43% of them had experience of hospitalization. Fourteen percent were in desensitization treatment and 21% had had such experience. The presence of paroxysm is described in detail; the causes of paroxysm were mainly house dust and Ambrosia artemisifolia, variety elatior.

61421 **APTIC NO. 84552**

Tomita, K., T. Kawaraya, T. Haruki, and M. Oka

EFFECTS OF AUTOEXHAUST ON RESPIRATION FUNCTION. *(Jidosha haigasu no kokyukino eno eikyo). Text in Japanese. Seikatsu Eisei (J. Urban Living Health Assoc.), 20(1):28-38, 1976. 17 refs.*

A comparative survey of the respiratory function of 836 residents along busy motor roads and of workers in shops polluted by auto exhaust in Osaka City during 3 years from 1970 was undertaken. The morbidity of respiratory diseases among those older than 40 was determined using BMRC questionnaires. The percentage FVC, FEV (1.0%), and average plus minus standard deviation of cardiopulmonary functional index were compared among classified 4 groups, exposed smokers, exposed non-smokers, non-exposed control smokers, non-exposed control non-smokers, however, no clear-cut difference was obtained. Average value and standard deviation of percentage FEV, FEV (1.0%), cardiopulmonary functional index of men and women by ages, and the frequency of persons with less than average minus standard deviation was compared between inhabitans, policemen and exhaust polluted workers; however, no clearcut difference was found between the frequencies. The frequency of both lower levels of FEV (1.0%) and cardiopulmonary function did not show any difference between the four groups mentioned above. The frequency of complaints of respiratory symptoms such as continued coughing, continued sputum, and continued coughing and sputum decreased in the order of exposed smokers, non-exposed control smokers, exposed non-smokers and non-exposed control non-smokers.

61422 **APTIC NO. 84539**

Tosaka, A., T. Suzuki, Y. Oshio, and O. Takayama

RESULTS OF EXAMINATION ON PITUITA OF SCHOOLCHILDREN IN AIR- POLLUTED AREA. *(Taikiosenchiku gakudo no hanajiru kensa seiseki). Text in Japanese. Nihon Jibi Inkoka Gakkai Kaiho (Jap. J. Otorhinolaryngol Soc.), 79(4):520, April 1976.*

From high, moderate, low, and non-polluted areas, a total of 1267 schoolchildren were selected and otolaryngologically examined. Of those considered to have nasal allergic diseases, 82 children were cytologically diagnosed by examination of the nasal mucosa and pituita. A difference of frequency of nasal allergy between children in highly polluted areas and in non-polluted areas was clearly recognized by examination of pituita. Cases of inflammation plus allergic rhinitis appeared more frequently in highly polluted areas than in non-polluted areas.

61423 **APTIC NO. 82868**

Toyoda, Y., M. Kubo, K. Yamamoto, Y. Nakajima, and S. Kusumoto

PATHOHISTOLOGICAL STUDIES ON THE UPPER AND LOWER AIRWAYS OF OZONE-EXPOSED ANIMALS PART 1. MAINLY ON THE CHANGE OF MUCOSA IN THE NASAL CAVITY. *(Ozone bakuro dobutsu ni okeru jo-ge kido no byorisoshikigakuteki kenkyu 1. Shutoshite bikonenmaku no henka ni tsuite). Text in Japanese. Nihon Jibi Inkoa Gakkai Zasshi (Jap. J. Otolaryngol.), 79(2):207, Feb. 1976.*

Mice were exposed to ozone at 3 ppm for 3 hr, and just after the exposure the morphological change of mucosa in the nasal cavity was examined microscopically. The major change consisted of the disorder or fall-out of cilia and the coverage by a mucosal layer of the ciliated epithelium, the former suggesting the process of degeneration and necrosis of epithelial cells and the latter suggesting the accentuation of secretion. These changes were more conspicuous in the middle - lower part of the nasal septum, in the neighborhood of the nasal turbinate and in the middle - lower part of the outer side walls; without, however, inflammation.

61424 **APTIC NO. 83706**

Toyoda, Y., M. Kubo, K. Yamamoto, Y. Nakajima, and S. Kusumoto

PATHOHISTOLOGICAL STUDIES ON THE UPPER AND LOWER AIRWAYS OF OZONE-EXPOSED ANIMALS PART 2. PATHOHISTOLOGICAL CHANGES WITH TIME AFTER EXPOSURE TO OZONE AT 5 PPM FOR 3 HOURS. *(Ozone bakurodobutsu ni okeru jo-gekido no byorisoshikigakuteki kenkyu 2. 5 ppm ozone, 3 jikan bakurogo no keiji henka). Text in Japanese. Nihon Jibi Inkoka Gakkai Zasshi (Jap. J. Otolaryngol.), 79(2):247, Feb. 1976.*

Histological observation was carried out on the nasal mucosa of mice immediately after, 24 hr after, and 48 hr after exposure to ozone at 5 ppm for 3 hr. In the epithelial layer, the cilia of the respiratory region began to be disordered and to fall out just after exposure, and some falling out of epithelial cells was observed. These symptoms were aggravated after 24 hr, with a layer-like adhesion of degenerated and fallen epithelial cells with mucous secretion on the surface of the mucosa, as well as flattening of the epithelial cells. After 48 hr, in addition to the same changes, mitosis appeared in nasoseptal epithelium, suggesting the onset of recovery. No change was seen in the olfactory region and no cell infiltration in the lower layer of the epithelium. Vessels showed no change just after exposure; however, expansion and hyperemia were seen after 24 and 48 hr. The production of mucous increased immediately after exposure. The PAS-positive material in the goblet cells did not increase immediately after exposure, but showed an increase of activity. The state of cilial cells after 48 hr was nearly the same as that after 24 hr.

61425 **APTIC NO. 84538**

Toyoda, Y., M. Kubo, K. Yamamoto, Y. Nakajima, and H. Kusumoto

PATHOHISTOLOGICAL STUDIES ON THE UPPER AND LOWER AIRWAYS OF ANIMALS EXPOSED TO OZONE PART 3. TIME CHANGE OF NASAL MUCOSA AFTER 3 HR EXPOSURE TO OZONE AT ONE AND THREE PPM. *(Ozone bakuro dobutsu ni okeru jo-gekido no byorisoshikigakuteki kenkyu Part 3 1 oyobi 3 ppm, 3 jikan bakuro go no binenmaku no keiji henka). Text in Japanese. Nihon Jibi Inkoka Gakkai Kaiho (Jap. J. Otorhinolaryngol Soc.), 79(4):531, April 1976.*

Twenty-one histological changes of the nasal mucosa of animals exposed to ozone at 1 and 3 ppm were examined immediatley, 24 hr, and 3, 5, and 10 days after the exposure. Generally, the pathological findings were fewer as the ozone concentration was lower. The most characteristic change was that of the epithelial layer of the respiratory parts: the disorder and fall-out of epithelial cells and cilia just after exposure; the flattening of the epithelial layer after 24 hr; the beginning of repair with the appearance of mitose on the epithelial layer of the nasal septum after 3 months. The morphology of the epithelial layer recovered after 10 days and 5 days, after exposure to ozone at 3 and 1 ppm, respectively. The changes of the goblet cells and the nasal vessels were not characteristic. No cellular infiltration of subepithelium or changes of smell epithelium were found.

61426 **APTIC NO. 84549**

Tsuji, T.

PREGNANT WOMEN AND ENVIRONMENTAL POLLUTION. *(Nimpu to Kogai). Text in Japanese. Josanpu (Midwives), no. 1:10-15, 1976.*

Obstetrical and gynecological studies in connection with environmental pollution yield information on the relationship between environmental pollution and pregnant women. The risks to pregnant women and their fetuses, the frequencies of stillborn, premature, and malformed babies, larger frequencies of respiratory infections in pregnant women and cases of neonatal jaundice are described. Offensive odors affect pregnant women, especially those with morning sickness.

61427 **APTIC NO. 83177**

Tsunoda, F.

EFFECTS OF FLUORINE COMPOUNDS ON MAN, AS AIR POLLUTANTS AND IN WORK PLACES. *(Shokuba to taikiosenbutsu to shite no fukkabutsu no nin-*

gen e no eikyo). Text in Japanese. Rodo no Kagaku (Dig. Sci. Labor), 31(4):10-16, April 1976. 12 refs.

Human injury by fluorine compounds in air has been experienced far more than 40 years in factories, but fluorine compounds as air pollutants were first recognized as a toxicant to plants and animal feed crops. Two cases of fluorine intoxication, one in a work place and the other affecting the general population directly in air and via other environmental routes are described. The primary health disturbance by inhalation of fluorine compounds involves the face, nose and eyes; no injury was found by inhalation at less than 10 ppb. The accumulation of fluorine from air to plants has been an important problem. The human intake of fluorine via several routes is illustrated. Chronic symptoms include macular teeth and osteosclerosis; dose-response relationships are known for the symptoms of both. Urinalysis of fluorine is described, emphasizing the accumulation of fluorine from the air in vegetables.

61428 **APTIC NO. 84696**

Uchiyama, T.

ALTERATION OF THE LUNG TISSUE AND, LIPIDS AND G-6-PASE ACTIVITY IN TRACHEAL EPITHELIAL CELLS DUE TO OZONE EXPOSURE, AND THE EFFECTS OF VITAMIN E ON THEM. *(Ozone bakuro ni yoru haisoshiki oyobi kikanjohi saibo no shishitsu to G-6-Pase kassei no henka to, korerani oyobosu Vitamin E no eikyo.) Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 11(1):55, 1976.*

The alteration of lipids in the pulmonary tissue and the activity of G-6-Pase in tracheal epithelial cells was studied on rabbits and mice exposed to ozone, the mice including those fed with a vitamin E deficient diet and having lower body weight. The life period following exposure of mice fed with a vitamin E deficient diet to ozone at 20 ppm was 10 32/60 hrs (ranging from 8 15/60- 12 5/60). After exposure at 5 ppm for 2 hr, peroxidated lipid in pulmonary tissue in mice fed with a vitamin E deficient diet noticeably increased, showing indirectly the antioxidation action of vitamin E on pulmonary lipids. Before ozone exposure, no effect of vitamin deficient diet appeared on fractions of phospholipid in pulmonary tissue; however, after exposure to ozone, a decrease of the lecithin fraction was found in those fed with vitamin E deficient diet. After isolating and fractionating the rabbits bronchial epithelial cells, G-6-Pase and Na+ - K+ ATPase were found active in the microsomal fraction and these activities had been decreased by 50% after exposure to ozone suggesting the disturbance of cellular membrane due to ozone. These facts indicated the peroxidation of lipids in pulmonary tissue, and the reduction of the lecithin fraction by ozone exposure, and the effect of vitamin E in preventing peroxidation of lipids by ozone.

61429 **APTIC NO. 84589**

Umeda, M., T. Suzuki, S. Nakazawa, H. Goto, and S. Nagaoka

ON THE EFFECTS OF ALTERNATING EXPOSURE TO NITROGEN DIOXIDE AND OZONE. *(NO2 to O3 no keizoku bakuro no eikyo ni tsuite). Text in Japanese. Kogai Kenkyu Nenpo (Annu. Rept. Tokyo Metropol. Res. Lab. Environ. Pollut.), vol. 1976:243-245, July 1976. 17 refs.*

To examine the effects of alternating exposure to nitrogen dioxide and ozone at a concentration less than that which causes death of the blood and other tissues, 100 SD-JCL male rats of age 10 wk were evenly divided into 5 groups, and exposed respectively, to pure air, to nitrogen dioxide at 30 ppm for 1.5 hr and then to ozone at 3 ppm for 3 hr, and to nitrogen dioxide at 30 ppm for 3 hr and then to ozone at 3 ppm for 3 hr. Half of each group was sacrificed just after the exposure, and the remainder were sacrificed 5 hr after the exposure. No significant difference was observed between the groups for red blood cells, hemoglobin, Ht sulfhydryl groups, total protein, albumin, cholesterol, and lacticdehydrogenase in serum. Serum-GOT, GPT, glucose, white blood cells, and ratio of neutrocytolymphocyte showed the largest change in the group exposed to ozone and the least change in the group exposed to nitrogen dioxide. The changes in the first-mentioned parameters in the group exposed to nitrogen dioxide and then to ozone were less than those of the group exposed only to ozone. Histological changes such as ablation of tracheal epthelium were most severe in the group exposed to nitrogen dioxide for 3 hr and then to ozone for 3 hr, followed by the groups exposed to both for 1.5 hr and the groups exposed to ozone. Apparently, the exposure to nitrogen dioxide activated the defense mechanism against ozone, and the changes of WBC and the ratio of neutrocyte/lymphocyte represent such as defense mechanism.

61430 **APTIC NO. 84619**

Wada, O. and S. Nagaoka

INTRODUCTION TO THE REPORTS OF POTENTIAL HUMAN EFFECTS OF AIR POLLUTION, ESPECIALLY THE STUDIES ON THE RELATIONSHIP TO CHRONIC OBSTRUCTIVE PULMONARY DISEASES. PART 3. *(Taikiosen no senzaiteki jintaieikyo, tokuni mansei heisokusei hai shikkan tono kanren ni kansuru kenkyu part 3). Text in Japanese. Kogai Kenkyu Nenpo (Annu. Rept. Tokyo Metropol. Res. Lab. Environ. Pollut.), vol. 1976:219, July 1976.*

Methods of studying injuries due to environmental pollution which depend on clinical examination are criticized. The necessity of establishing methods for identifying health effects which do not appear as conspicuous clinical symptoms is stressed. Epidemiological study using polluted and control areas is stressed. Internal medicine, disease histories, roentgenography, and measures of pulmonary function, tracing by immunocerology and by otorhinolaryngological methods, and establishment of an index of physiological effects of air pollution are discussed.

61431 **APTIC NO. 84661**

Wada, O.

STUDIES ON THE POTENTIAL CHARACTERISTIC INDEX OF HUMAN EFFECTS BY AIR POLLUTION - ESPECIALLY ON PHYSIOLOGICAL SAMPLES AS THE INDICES. *(Taikiosen ni yoru jintaieikyo no senzaiteki shihyo ni kansuru kenkyu - tokuni seitai shiryo ni kansite). Text in Japanese. Kogai Kenkyu Nenpo (Annu. Rept. Tokyo Metropol. Res. Lab. Environ. Pollut., vol. 1976:220-223, July 1976.*

The delta-aminolevulinic acid dehydrase activity (ALAD) in erythrocytes, the lead content of blood(Pb-B), the hematocrit percent(Ht), urinary protein, sugar and delta-aminolevulinic acid (ALA) were determined for 40 residents in the polluted Koto area and 40 in the non-polluted and Tama area in summer and in winter of 1974 and 1975. Except for a few diabetes patients, almost all the data were in the normal range. However, significant differences between the two areas were found for ALA-D in summer and for Pb-B. There was a correlation between Pb-B and ALA-D in 1975, as in 1974 and 1973. The examination of ALA-D in erythrocytes is thus a useful method for detecting potential effects. It is necessary to study the correlation between those indices already utilized and other indices, such as data on respiratory function.

61432 **APTIC NO. 84690**

Wakisaka, Ichiro

SENSORY IRRITATION BY SULFITE AEROSOLS ON THE UPPER RESPIRATORY TRACT IN MICE. *Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 31(2): 347-352, June 1976. 11 refs.*

It has been shown that an increase in the activity of trigeminal nerve afferents brought about by chemical irritants results in inhibition of the respiratory rate, followed by a gradual recovery toward pre-exposure rates during continued exposure. Sodium metabisulfate aerosol was found to exert a characteristic respiratory reaction similar to sulfur dioxide, while sodium sulfite aerosol was inactive. In order to obtain more information on the sensory irritation potential of sulfites, alterations in the respiratory rate of mice in response to inspired sulfite aerosols were studied in comparison to alterations resulting from SO2. When mice were exposed to aerosols of sodium bisulfite or potassium bisulfite, a rapid decrease of respiratory rate occurred at the beginning of exposure, reached a peak, and then decreased with continued exposure. This pattern was the same as that obtained for SO2. Exposure to sodium sulfite or potassium sulfite resulted in no consistent decrease of the respiration rate. Mice desensitized by exposure to SO2 no longer reacted to an equivalent concentration of sodium bisulfite. It was concluded that the sensory irritant potency of SO2 and its salts is due to the reducing property of bisulfite anion formed in the nasal mucosa independently of the added cation.

61433 **APTIC NO. 82813**

Weiss, Karen D. and Harold S. Weiss

INCREASED LUNG COMPLIANCE IN MICE EXPOSED TO SULFUR DIOXIDE. *Res. Commun. Chem. Pathol. Pharmacol., 13(1):133-136, Jan. 1976. 14 refs.*

Mice were exposed for 6 to 9 days to 40 ppm sulfur dioxide. They lost 21% of body weight, but static lung compliance increased 37%. Slopes of saline volume-pressure curves increased 8%, pointing to a decrease in surface tension rather than tissue elasticity. Alveolar stability, lung weight and lung wet/dry ratio decreased 2 to 6%, whereas trapped gas increased 17%, but none were statistically significant. (Author abstract)

61434 **APTIC NO. 83587**

Wildman, Joseph M., Michael L. Freedman, Judith Rosman, and Bernard Goldstein

BENZENE AND LEAD INHIBITION OF RABBIT RETICULOCYTE HEME AND PROTEIN SYNTHESIS: EVIDENCE FOR ADDITIVE TOXICITY OF THESE TWO COMPONENTS OF COMMERCIAL GASOLINE. *Res. Commun. Chem. Pathol. Pharmacol., 13(3):473-478, March 1976. 16 refs.*

The combined effects of lead and benzene, which are both components of commercial gasoline, on heme and protein synthesis in rabbit reticulocytes were investigated. Benzene and Pb individually inhibit both intact reticulocyte heme and protein synthesis in the presence or absence of iron transferrin. When the two compounds are present in the same incubation, their effects are additive. Although both Pb and benzene may be components of the same gasoline, the mode of exposure differs. Benzene is highly volatile but is consumed in the internal combustion engine. Lead additives are relatively nonvolatile, but are emitted from the tailpipe as respirable sized particles. Combined exposure to relatively high levels of both of these agents is limited to occupations in which both raw gasoline fumes and automotive emissions are present. Further evaluation of the combined risks of these agents is needed. (Author abstract modified)

61435 **APTIC NO. 84517**

Yamamoto, H. and K. Takagi

SYSTEMATIZATION OF THE EPIDEMIOLOGICAL SURVEY OF AIR POLLUTION. *(Ekigakuchosa-Taikiosen ni Kanshiteno tameno system-ka). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis., vol. 1976:7, 1976.*

In an epidemiological survey, the necessary requirements are: (1) easy movement to the place where the survey is carried out, (2) short time period of inspection, (3) high accuracy and reproducibility (4) light burden on the subjects and the inspectors, (5) rapid availability of the results of examinations and (6) easy treatment of the data of examinations. By utilizing computers, these requirements can be satisfied. Smoking was chosen as the subject of a systematized epidemiological survey. Of the several exogenous factors, smoking, the most important single factor, is measurable; it affects chronic bronchitis and pulmonary emphysema. The smoking history, disease history, and symptoms of healthy men without cardiopulmonary disease were determined and they were examined with spirometry for flow-volume curve, closing volume, and fractional vital capacity. A statistical treatment using multi-variable analysis was carried on the data.

61436 **APTIC NO. 84554**

Yamazaki, S., K. Tsuji, and C. Watanabe

RESULTS OF VENTILATING FUNCTION EXAMINATION AND OF GAS ANALYSIS OF BLOOD OF PATIENTS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASES IN YOKKAICHI AREA. *(Yokkaichi-chiku ni okeru mansei heisokusei hai shikkan no kanki-kino kensa to ketsueki gas bunseki no kekka ni tsuite). Text in Japanese. Koshu Eisei (Public Health), 40(6):431-436, June 1976. 6 refs.*

Ventilating function (vital capacity (vc), percent vital capacity (%vc), one second volume (FEV-1.0), one second rate (FEV-1.0 divided by vc, multiplied by 100, index), pH, PaO2 (oxygen pressure), and PaCo2 (carbon dioxide pressure) of arterial blood were determined on 103 patients (53 with bronchial asthma, 43 with chronic bronchitis, and 2 with pulmonary emphysema) officially recognized to be due to air pollution who were treated in a hospital in Yokkaichi in October and November 1974. The average age of the patients was 60.3 (62.1 in men and 58.7 in women). The average age of patients with bronchial asthma, chronic bronchitis, and pulmonary emphysema was 56.0 64.8, and 67.5 respectively. Reduction of ventilating function was most highly recognized in patients with pulmonary emphysema, and followed by the other two disease with 11, 30, 14 and 48 cases of normal, obstructive, infarctive and combined type of disturbance. The reduction of % vc and index were more conspicuous with age; however, the low average FEV-1.0% of 58.0 is not due to age. The reduction of the function was higher in men than in women. No relationship was found in 20 cases of 38 smokers; however, a significant difference was found among them in the analytical values of arterial blood. The respiratory index showed relatively good correlation with % vc; however, the former showed relatively low correlation to FEV-1.0%. There was a reduction of PaO2 and increase of PaCO2 in arterial blood of pulmonary emphysematous patients with respiratory acidosis. There was a positive correlation between %vc and PaO2, between FEV-1.0% and PaO2, and between the index and PaO2.

61437 **APTIC NO. 84677**

Yamazaki, S., K. Tsuji, and C. Watanabe

RESULTS OF PULMONARY VENTILATION AND ANALYSIS OF GASES IN BLOOD OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS IN YOKKAICHI AREA. *(Yokkaichi -chiku ni okeru manseiheisokusei haishikkan no kankino kensa to ketsueki-gas bunseki no kekka ni tsuite). Text in Japanese. Koshi Eisei (Public Health), 40(6):431-435, June, 1976. 6 refs.*

Examinations of pulmonary ventilation and analysis of gases in blood in 103 officially recognized victims of air pollution who were treated during 2 months beginning Oct. 1974 are described. Vital capacity, percentage vital capacity, one-second volume, one-second rate, and respiratory index were recorded. The chronic obstructive pulmonary diseases were bronchial asthma, (53 patients) chronic bronchitis (48 patients) and pulmonary emphysema (2 patients). Equal moderate degrees of reduction of function were found in patients with bronchial asthma and chronic bronchitis; a high degree of reduction of function was found for pulmonary emphysema. The number of normal, obstructive, and combined types of functional disturbance was 11, 30, 14 and 48, respectively. A relatively better correlation was found between the respiration index and the percentage vital capacity. The correlation between the respiration index and one-second rate was found. The pH, PaO2 and PaCOa in arterial blood of bronchial asthma and chronic bronchitis patients were almost the same; however, a reduction of PaO2 and increase of PaCO2 with respiratory acidosis occurred with pulmonary emphysema. As 69 patients were older than 60, however, no definite results could be obtained by examination of respiratory function alone.

61438 **APTIC NO. 84676**

Yoshida, K., M. Imai, and M. Kitabatake

AIR POLLUTION AND ASTHMA. *(Taikiosen to zensoku). Text in Japanese. Rinsho Kagaku (Clin. Chem.), 12(4):482-489, 1976. 18 refs.*

A recent abnormal occurrence of asthma during air pollution with pollutants which could not be allergens (Individually by themselves (sulfur dioxide, sulfuric acid mist, nitrogen oxide, nitrogen dioxide, and photochemical oxidant) was studied. Yokkaichi asthma cases were cited and the characteristic features of the disease were compared to those of Yokohama asthma. Air pollution reduces the threshold of asthma for those who are potentially asthmatic. Animal experiments are described in which rats inhaled sulfur dioxide, nitrogen oxides, and ozone with simultaneous sensitization by heteroalbumin. The degree of experimental asthma increased. The result suggested that the threshold value of asthmatic susceptibility had been reduced. The usual air pollutants could accelerate the occurrence of asthmatic paraoxysms by causing acetylcholine-hypersensitivity of the airway. Methods of preventing asthma during air pollution are described.

61439 **APTIC NO. 84532**

Yoshida, T. and Y. Kawakami

STUDIES ON METEOROLOGICAL AND AIR POLLUTION FACTORS IN THE CASES OF BRONCHIAL ASTHMA IN HACHIOJI CITY. PART 1. *(Hachioji-shi ni okeru kikanshizensoku to taishoyoin narabini taikiosen yoin ni kansuru kenkyu). Text in Japanese. Arerugi (Japan J. Allergy), 25(4):290-291, April 1976.*

From the asthmatic diaries of bronchial asthmatic patients (33 children and 13 adults) the frequency of stridor and paroxysmal dyspnea were quantitized as asthmatic strength number. The data were compared with the factors of air pollution obtained from the Hachioji City Office, taking into consideration meteorological factors. The results indicated that in September when the frequency of paraoxysm was highest, the asthmatic strength number was highly correlated with nitric oxide concentration; in November and December it was significantly correlated with concentration of sulfur dioxide, nitrogen dioxide, floating dust, hydrocarbons, and NO; in August there was a significant correlation with oxidant; however, no correlation was found with carbon monoxide. The fluctuation of NO in a day seems to coincide with the time period within which the paroxysm is most apt to occur. As for meteorological factors, the paroxysm tended to occur when the atmospheric pressure was higher in the north and at the front, middle, and lower region of the moving-type high pressure, and higher concentration of NO tended to accompany this atmospheric pressure change. The paroxysm frequently occurred with high NO concentration when it was clear with high differential temperature and soft wind, and both were rare when it was rainy with small differential temperature, strong wind, and higher humidity.

61440 **APTIC NO. 83179**

Yoshikawa, H.

INTOXICATION BY FLUORIDES. *(Fukkabutsu chudoku). Text in Japanese. Rodo no Kagaku (Dig. Sci. Labor), 31(4):4-9, April 1976.*

General problems of fluorides in ecological systems and of the toxicity of fluorides are outlined. The natural background concentration of fluorine in air is 0.01-3.9 microgram/cu m and that in drinking water is from trace to 10 ppm, in most cases less than 0.1 ppm. The fluorine compounds to which workers are exposed include molecular fluorine, hydrogen fluoride, and several metal fluorides. The toxicity of inorganic fluorine compounds is stressed, including gaseous fluorine, hydrogen fluoride, silicon tetrafluoride, boron trifluoride and oxygen difluoride. The health hazard of fluorine compounds is described in detail for inhalation and absorption from skin by contact with fluoride particles in air. Chronic intoxication due to fluorine compounds, fluorosis, is described in detail.

61441 **APTIC NO. 81881**

National Academy of Sciences, Washington, D. C., Subcommittee on Selenium

SELENIUM (FINAL REPORT). *Environmental Protection Agency Contract 68-02-1226, Program Element 1AA601, Rept. EPA-600/1-76-014, 317p., Jan. 1976. 894 refs.*

Selenium and its compounds are reviewed in terms of their occurrence in the environment and their toxicity. Specific topics covered include: industrial and agricultural uses of selenium compounds; environmental cycling of selenium compounds; the effects of selenium and its compounds on plants, animals, and man; and methods for the sampling and analysis of selenium. Although selenium is highly toxic in many of its chemical forms, it does not appear to be a significant pollution problem. The burning of coal and oil account for nearly 70% of the selenium emitted to the atmosphere. The chemical forms of selenium liberated by the combustion of fossil fuels are either insoluble (elemental selenium) or are bound tightly by soil colloids (selenium dioxide). Moreover, these likely forms of airborne selenium tend to aggregate in particulate form and thus are not expected to be as widely dispersed as gaseous contaminants. Pesticidal uses of selenium in agriculture exert a negligible impact on the environment. Signs of selenium poisoning in man include: pallor, nervousness, coated tongue, depression, dermatitis, gastrointestinal disturbances, and garlic odor of the breath. No deaths among industrial workers suffering from selenium intoxication are reported. (Author conclusions modified)

61442 **APTIC NO. 83704**

Himeji Municipal Health and Nuisance Office and Himeji City Medical Assoc.

RESULTS OF INVESTIGATION ON THE EFFECTS OF AIR POLLUTION ON PRIMARY SCHOOLCHILDREN. *(Shogakko-jido o taisho to suru eikyo chosa). Text in Japanese. In: Report On Investigation Of Effects Of Air Pollution On Human Health In Himeji, 1974, p. 42-98, 1976.*

The results of an investigation of the effects of air pollution on the health of primary schoolchildren is reported. Lung function was examined by a peak flow method. School absenteeism was looked at. Questionnaires were sent to parents and their children. The morbidity of asthma in children was studied. Respiratory resistance was not significantly different between children living in different areas of the city. The major cause of school absence was respiratory disease, mainly colds; however, there was no correlation with air pollution such as falling dust and sulfur dioxide. Although there was some difference between the answers of the parents and those of their children, the number of persons complaning of subjective symptoms was smaller in non-polluted areas than in polluted areas. The morbidity of asthma increased a little in 1974 compared to 1973, with 20% of attacks seemingly connected to air pollution.

61443 **APTIC NO. 84556**

Shizuoka Prefectural Office (Japan)

COUNTERMEASURES FOR HEALTH IMPAIRMENT DUE TO ENVIRONMENTAL POLLUTION. *(Kogai hoken taisaku). Text in Japanese. In: Shizuoka Prefecture White Paper on Environmental Pollution, p. 170-172, 1976.*

Fuji City, where air pollution due to the paper industry is the worst in Shizuoka Prefecture with numerous occurrences of respiratory diseases, has established a system of relieving the patients officially recognized to be ill due to air pollution. The number of such patients recognized in a year including those recognized by the national law was 81, 229, 261, 152, and 87, respectively in 1970, 1971, 1972, 1973, and 1974, showing a decreasing trend. The existing number of emphysema patients as of March 1975 was 31.

61444 **APTIC NO. 84663**

Central Council for Control of Environmental Pollution and Specialist s Committee for Environmental Standards for Lead

REPORT ON THE HEALTH EFFECTS OF LEAD IN THE AIR, MAY 26, 1976. *(Taikichu namari no kenko eikyo ni kansuru hokoku). Text in Japanese. Air Pollut. News Rept., no. 95:2-7, July 1976. 23 refs.*

The natural background of concentration of lead, the recently determined (1970-1974) concentration of lead in urban air, and the concentration of lead in air along motor roads in Tokyo (average 3.19 microgram/cu m in 1970 and 0.79 microgram/cu m in 1974), and the amount of lead intake into the human body from food (239-318 microgram/day/person in Japan) are described. The average lead intake by inhalation was calculated at 24 microgram/day/person. The effects of lead on human health, especially the relationship between the amount of lead in air and the amount of lead in human blood, indicate no positive correlation. It was concluded that the present average concentration of lead in urban air (1-3 microgram/cu m) will not increase the concentration of lead in human blood and will not have undesirable effects on human health. However, in the vicinity of busy intersections and in factories handling lead, the necessity of lead monitoring in the air and in the blood of inhabitants and workers is emphasized.

1975

61445 **APTIC NO. 82438**

Abe, T.

RESULT OF SURVEY OF RESPIRATORY SYMPTOMS ON BABIES OF 3 YEARS OLD AND SUCKLING BABIES BY INQUIRIES TO THEIR NURSES. *(3-saiji, nyuji no kokyuki shojo enquete chosa). Text in Japanese. (Shoni Hokem Kenkyu (J. Child Health), 34(5):262-263, 1975.*

Nurses were asked about the respiratory symptoms of 1398, 1407, and 2296 3-year-olds in 1970, 1971 and 1972, and of 1208 and 1414 suckling babies in 1970 and 1971. The patients who were subject to catching cold, those diagnosed for bronchial asthma or infantile asthma, and those diagnosed as having asthmatic bronchitis were more numerous among 3-year-olds than in sucklings. Such morbidity was higher in the Konakano area, where air pollution was the suspected cause. The total number of sucklings diagnosed for bronchial asthma and those diagnosed for asthmatic bronchitis was higher in the Konakano and Same areas. The total number of 3-year-olds diagnosed for such diseases was larger in 5 areas studied, by about a factor of 2, than in a control area.

61446 **APTIC NO. 76197**

Angle, Carol R. and Matilda S. McIntire

LEAD: ENVIRONMENTAL SOURCES AND RED CELL TOXICITY IN URBAN CHILDREN (FINAL REPORT). *Nebraska Univ., Omaha, Environmental Protection Agency Grant 802043, Program Element 1AA005, Rept. EPA-650/1-75-003, 90p., June 1975. 63 refs.*

Lead from multiple sources in the Omaha, Nebraska area was correlated with blood lead levels in children divided into three age groups, 2-5, 10-12, and 14-18 yr. Children living in urban areas showed higher blood lead levels than those living in suburban areas, although the differences decreased with age. Increased blood lead levels correlated with increased lead in urban dustfall, yard soil, and boot tray lead. There was no significant urban-suburban difference in airborne lead, housedust lead, paint chip lead, or lead in milk and water. Lead in yard dirt and blood lead both correlated with residential proximity to traffic. Although all blood lead levels were below 40 micrograms/dl, there was a significant linear increase in red blood cell membrane sodium/potassium adenosine triphosphatase as blood lead increased. Children with blood lead levels above 20 micrograms/dl showed decreased red blood cell glutathione and increased G-6-PD and 6-PGD activities. The increase in the later two enzymes supports decreased red blood cell survival at the level of lead exposure of urban children. Iron deficiency anemia showed no correlation with blood lead. (Author abstract modified)

61447 **APTIC NO. 84260**

Antweiler, H.

EFFECT AND LIMITS OF GASEOUS AIR POLLUTANTS. *(Einwirkung und Grenzwerte gasfoermiger Luftverunreinigungen). Text in German. Oeffentl. Gesundheitswesen (Stuttgart), 37(9):513-519, 1975.*

The most important groups of noxius gases and vapors, the type and mechanism of their effect on man, and limits to prevent health damage are reviewed. Four different groups were differentiated: (1) irritants, (2) asphyxiators, (3) anesthetics and narcotics, and (4) systemic gases effective subsequent to resorption. Among those in group (1) were aldehydes, ammonia, hydrogen chloride, hydrogen fluoride, sulfur dioxide, and sulfur trioxide, all of which attack the upper respiratory tract; and halides and ozone that attack the lungs. The terminal pulmonary region (alveoli) was the target of phosgene and nitrogen dioxide. Group (2), carbon dioxide, helium, methane, ethane, nitrogen, and nitrous oxide, disturb oxygenation of the tissues, and diluted atmospheric oxygen. Others, such as carbon monoxide, nitrobenzene, hydrogen cyanide and hydrogen sulfide disrupt O2-transport or tissue oxygenation. The gases in group (3), acetylene, ethylene, propane, acetone, and alcohols, had a depressant effect on the CNS. Systematically effective gases in group (4), halogenated hydrocarbons, benzene, phenol, carbon disulfide and methanol, act on visceral organs, hematopoiesis and the CNS. Problems of industrial toxicology relating to operations in more or less enclosed industrial spaces, involve the whole spectrum of noxious gases and vapors because of their acute danger, due to accidents, or their health damage attributable to long-term exposure. The situation of atmospheric pollution by virtually innumerable substances, among them numerous gases and vapors, was different since only a relatively small number of the latter occurred at health-threatening concentrations. Smog catastrophes have recently occurred in various locations all over the globe, the result of inverted climatic conditions and the absence of air flow. Gases, vapors and floating particles from industrial and residential sources near ground level caused the death of people with chronic bronchitis and emphysema.

61448 **APTIC NO. 82189**

Aoki, K. and H. Shimizu

EDIDEMIOLOGICAL STUDY OF LUNG CANCER. ON RELATIONSHIP BETWEEN TRAFFIC VOLUME AND DEATH RATE FROM LUNG CANCER. *(Haigan no ekigakuteki kenkyu-jidoshakotsuryo to haigan shiboritsu tono kanren ni tsuite). Text in Japanese. Preprint, Japan Society of Lung Cancer, Tokyo, p. 230, Oct. 1975. (Presented at the Japan Society Lung Cancer Meeting, 16th Osaka, Sept. 30 - Oct. 2, 1975.)*

A study was carried out along and around roads and crossings with traffic volumes of more than 1000 cars between 7 am and 7 pm in a city with a population of two million. Along a road with a traffic volume of more than 20,000 cars, the death rate from lung cancer (based on the number of deaths in the period 1969 to 1972) was 69/10,000 within 50 m from the road and

48/10,000 between 50 and 100 m. Along roads with less than 20,000 cars, the rates were 42 and 38/10,000, indicating no significant difference. At crossings, the death rate was 78/10,000 within a radius of 10 m, and 52 between 100 and 200 m, an increase especially notable in females. These are are rough death rates, requiring further interpretation with other factors. The age distribution of the deaths from lung cancer along the roads peaked in the range of 66 to 70 years, but with no difference for distance. At the crossings the peak age was 61 to 65. The sexual ratio (female/male) of mortality with 100 m of the crossing was 2.0 and 3.3 between 100 and 200 m.

61449 APTIC NO. 83569

Araki, Shunichi

FACTOR ANALYTICAL OBSERVATION ON DOSE-RESPONSE RELATIONSHIP OF LEAD IN THE OCCUPATIONALLY NON-EXPOSED. *Ind. Health (Japan), 13(3):81-92, Sept. 1975. 22 refs. (Presented at the Japanese Society of Public Health, Annual Meeting, 32nd, 1973.)*

The interrelationships of parameters relevant to lead exposure were statistically investigated using factor analysis. The parameters were classified into three groups: the first group contained Pb mobilized by calcium ethylenediaminetetraacetic acid (CaEDTA) and Pb in blood, which are related to the body burden of Pb; the second group, delta-aminolevulinic acid (delta-ALA) dehydratase (ALA-D) in erythrocytes, delta-ALA in urine, coproporphyrin in urine and Pb in urine, which is the body burden of Pb; the third group, hemoglobin in blood. The influence of Pb to blood hemoglobin level is not found under usual urban environments. The regressions of urinary coproporphyrin and erythrocyte ALA-D activity on Pb mobilized by CaEDTA or blood Pb are nearly linear in people free from occupational Pb exposure. (Author abstract modified)

61450 APTIC NO. 79692

Bariliak, I. R., I. A. Vasiljeva, and L. P. Kalinovshaja

EFFECTS OF SMALL CONCENTRATIONS OF CARBON BISULFIDES AND HYDROGEN SULPHIDE ON INTRAUTERINE DEVELOPMENT IN RATS. *Text in Russian. Arkh. Anatom. Gistol. Embriol., 68(5):77-81, 1975. 14 refs.*

The effects of small concentrations of carbon bisulfide and hydrogen sulfide on embryonic development of rats under conditions of the viscose fiber industry were studied. Prolonged exposure has an embryotoxic effect at the pre- and postimplantation stages. The substances are responsible for the appearance of abnormalities, predominantly of the urogenital and bone systems in a few embryos. They disturb embryonal blood formation and the ossification process, and result in severe changes of the parenchymatous cells of the liver and kidneys of rat embryos. (Author abstract)

61451 APTIC NO. 84270

Beck, Ernst G.

CLEAN AIR MAINTENANCE: DIFFICULTIES OF THE QUANTITATIVE DETERMINATION OF FIBERS. *(Luftreinhaltung: Fasermengen sind schwer zu messen). Text in German. Umwelt (Duesseldorf), 4(8):29,31, 1975. 2 refs.*

Fibers as air pollutants are characterized by a length to diameter ratio of between 3:1 and 20:1. Most significant are asbestos fibers, known to be damaging when inhaled with the air in asbestos processing plants, causing changes in the lung tissues called asbestosis and being conducive to bronchial, stomach, and intestinal cancer, and to formation of tumors in the pleura and the peritoneum. It has been proven that the carcinogenic effects of asbestos and glass fibers are due to the fiber form, and not their chemical and mineral characteristics. Such fibers are also found in the outside atmosphere away from the working areas. There, the question of maximum permissible immission values has not yet been resolved. The latest tests have shown that the outside air carries 1000 to 10,000 fibers per cu m, most of them shorter than 5 micron and smaller than 0.5 micron in diameter. Due to this small quantity and size, the measurement of fibrous dusts in the outside air has so far been extremely difficult. Microscopic particle counting, combined with microanalysis should be used to determine the type and origin of fibers.

61452 APTIC NO. 83016

Blot, William J. and Joseph F. Fraumeni

ARSENICAL AIR POLLUTION AND LUNG CANCER. *Lancet, 2(7926):142-144, July 26, 1975. 15 refs.*

The mortality patterns for lung cancer in U. S. counties where nonferrous ores are smelted and refined were analyzed. The 1963 Census of Manufactures lists 89 U. S. counties with manufacturing units engaged in the primary smelting and refining of nonferrous ores. The number of employees for each manufacturing unit and provided in intervals. The total number of workers for each county was estimated by multiplying the number of units by the midvalue of the intervals and summing over units. Eighteen counties with fewer than 0.1% of the county population working in the industry were excluded. The remaining 71 counties had an estimated 50,855 persons employed in smelting and refining. These counties were divided into two groups according to the type of ore processed: copper, lead, or zinc, which contain substantial amounts of inorganic arsenic, later released during processing, and aluminum or other nonferrous metals which contain relatively small amounts of arsenic. Thirty-six counties were in the first group, 35 in the second. Cancer mortality-rates were calculated for the white population in the 71 counties from 1950 to 1969, as well as in the remaining 2985 counties in the contiguous states. Demographic and socioeconomic data for 1960 were obtained from census statistics. A general linear hypothesis model was used to test for statistically significant differences in cancer mortality between the counties with and without smelting and refining. Average mortality-rates from lung cancer for white males and females were signficantly increased in counties with copper, lead, or zinc smelting and refining industries, but not in counties where other nonferrous ores are processed. The excess mortality was not attributed to differences in geographic region, population density, urbanization, socioeconomic status, or other manufacturing processes. The findings suggest the influence of community air pollution from industrial emissions containing inorganic arsenic. (Author abstract modified)

61453 APTIC NO. 83531

Blumer, W.

DAMAGES AS THE RESULT OF EXHAUST GASES DEMONSTRATED BY DETERMINATION OF THE DELTAAMINOLAEVULINIC ACID. *(Bleischaedigung durch Autoabgase nachgewiesen mit der Deltaaminolaevulinsaeurebestimmung). Text in German. Soz. Praeventivmed., 20(1):17, Jan.-Feb. 1975. 6 refs.*

The deltaaminolaevulinic acid in urine was determined in 17 patients suffering from nervous symptoms (headache, fatigue, and abdominal troubles). Motorists and people living in houses situated along a main road had elevated levels. Treatment with calciumversenat, sodium citrate, and vitamins eliminate and neutralized the lead. The content of deltaaminolaevulinic acid decreased to normal levels (6.6 to 2.6 mg/L) and the patients were cured.

61454 APTIC NO. 80198

Bourbon, Pierre, Guy Bompart, and Pierre Levy

IN VITRO ACTION OF NITRIC OXIDE ON THE OXYHEMOGLOBIN DISSOCIATION CURVE. *(Action in vitro de l oxyde nitrique sur la courbe de dissociation de l oxyhemoglobine). Text in French. C. R. Acad. Sci., Ser. D, 280(21):2503-2504, June 1975. 4 refs.*

The influence of nitric oxide, used in a concentration of 7 ml/cu m, on the dissociation curve of oxyhemoglobin was stu-

died in rabbit blood in an in vitro test to establish the action the effect of this air pollutant on the affinity of hemoglobin for oxygen. Equilibration of the blood specimen with NO in nitrogen current for 5 hr revealed that NO decreases the affinity of hemoglobin for oxygen under in vitro conditions.

61455 **APTIC NO. 82750**

Bridbord, K., J. F. Finklea, J. K. Wagoner, J. B. Moran, and P. Caplan

HUMAN EXPOSURE TO POLYNUCLEAR AROMATIC HYDROCARBONS. *Preprint, National Inst. for Occupational Safety and Health, Rockville, Md. and Concinnati, Ohio and Environmental Protection Agency, Research Triangle Park, N. C., 14p., 1975. 6 refs. (Presented at the Polynuclear Aromatic Hydrocarbons Symposium, Columbus, Ohio, Oct. 17, 1975.)*

An activity profile model approach for assessing exposure to polynuclear aromatic hydrocarbons is presented. Benzo(3-4)pyrene is measured in particulate matter is used as an index compound for exposure to polynuclear organics; and exposures are expressed in terms of cigarette equivalents, i.e., the number of cigarettes smoked which results in a similar benzo(3-4)pyrene intake. Sources of exposure considered included: active smoking, indoor exposure to sidestream cigarette smoke, occupational exposure to polynuclear compounds, and exposure to motor vehicle emissions. The most important source of benzo(3-4)pyrene exposure for smokers appears to be from cigarettes. Workers in selected occupations, however, are exposed to orders of magnitude greater levels of benzo(3-4)pyrene than the cigarette smokers. Benzo(3-4)pyrene emissions from motor vehicles are relatively small compared to other sources. However, such exhaust emissions make an important contribution to the total exposure for nonsmoking urban residents. Although benzo(3-4)pyrene represents a poor surrogate since other polynuclear compounds may predominate, better data are generally not available. (Author abstract modified)

61456 **APTIC NO. 79170**

Bryan, Sam D.

AN ON-LINE PDP-12 SPIROMETRY PACKAGE THAT SUPPORTS BOTH ONSITE AND REMOTE STATIONS. *In: OR and D ADP Working Proceedings No. 1, Environmental Protection Agency, Washington, D. C., Office of Research and Development, Rept. 600/9-75-002, p. 99-103, Jan. 1975. (Presented at the Office of Research and Development Automatic Data Processing Workshop, Bethany, W. Va., Oct. 2-4, 1974.)*

NTIS: PB 241 150

An on-line computerized data analysis system for spirometry testing at the Environmental Protection Agency s Human Studies Laboratory is described. The correct interpretation of digital values in terms of corresponding flow rates of air in the spirometer is accomplished by a calibration procedure prior to subject testing. The technician informs the computer by teletype of the occurrence of a zero flow (baseline) and of a 10-liter/sec flow calibration signal provided by special amplifier circuit. The two digital values observed can then be used by the program in a simple interpolation formula to relate any observed digital value to the corresponding flow rate. After calibration and following a successful breathing manuever, a teletype key is activated causing the computer to analyze the last 10 sec of flow data. Currently, statistical analysis of the data is performed off-line on a Univac 1110 computer.

61457 **APTIC NO. 84320**

Butler, John D.

AIR POLLUTION, SMOKING AND LUNG CANCER. *Chem. Brit., 11(10):358- 363, Oct. 1975. 24 refs.*

Toxicological and epidemiological evidence for a relationship between lung cancer and exposure to air pollution either alone or in combination with cigarette smoking is presented. The injection of atmospheric samples from the Los Angeles area which contained polynuclear compounds resulted in the incidence of 41 solitary pulmonary tumors in 77 mice as compared to 16 such tumors in 90 control mice. A comparison of lung cancer death rates among smoking and non-smoking males (ages 45-54) living in rural and urban areas showed a death rate of 31 per 100,000 for non-smokers in urban areas as compared to 0 per 100,000 for non-smoking inhabitants in rural areas. The death rates for heavy smokers living in rural and urban areas were 117 and 205 per 100,000, respectively.

61458 **APTIC NO. 76491**

Cassan, Stanley M. and Daniel H. Simmons

NITROGEN DIOXIDE AND THE ERYTHROCYTE REDOX STATE. *Arch. Environ. Health, 30(10):502-506, Oct. 1975. 32 refs.*

Normal human erythrocytes were exposed for 2 hr at 38 C to an atmosphere of air containing variable concentrations of nitrogen dioxide. Substantial increases in the redox ratio were noted only when NO2 concentrations exceeded 15 ppm. In the range of 15 to 500 ppm NO2, the increase in the redox ratio was significantly correlated with the NO2 concentration. Intracellular to extracellular anion distribution ratios for chloride, lactate, and pyruvate were similar in NO2 and non-NO2 exposed cells. A direct cytoplasmic NO2-induced biochemical change may be mediated by a mechanism other than lipid peroxidation was identified. (Author abstract)

61459 **APTIC NO. 80320**

Charles, J. M. and D. B. Menzel

ABSORPTION OF SULFATE IONS IN THE RAT LUNG. *Res. Commun. Chem. Pathol. Pharmacol., 12(2):389-396, Oct. 1975. 12 refs.*

The absorption of 35 sulfur-sulfate ions from the rat lung in the presence of sodium, ammonium, and chloride ions was investigated. A solution of 0.1 ml of isotonic sucrose containing the salts was instilled via a tracheal cannula into anesthetized animals. After various times the lungs were removed and assayed for 35S-radioactivity. Sulfate ion absorption was nonsaturable and proportional to the concentration of sulfate ion. The half life for sulfate absorption in the presence of sodium ions was found to be 34.5 minutes. Ammonium ions enhanced the absorption of sulfate ions by 10.8 + or - 3.1%, and chloride ions decreased the absorption of sulfate ions by 6.6 + or - 3.0%. (Author abstract modified)

61460 **APTIC NO. 83899**

Charlesworth, F. A.

THE FATE OF FLUOROCARBONS, INHALED OR INGESTED. *Food Cosmet. Toxicol. (London), 13(5):572-574, Oct. 1975. 7 refs.*

Threshold levels of both fluorocarbon and adrenaline in blood are apparently required for the heart to become sensitized. A previous experiment with beagle dogs inhaling fluorocarbons is reported. Although fluorocarbon concentrations producing cardiac sensitization vary, blood levels resulting from exposure to these concentrations differed little among the two carbon fluorocarbons or between fluorocarbon 11 and fluorocarbon 12. Experiments with human volunteers inhaling fluorocarbon aerosols are reported. The observed patterns of fluorocarbon exhalation are described. The mean alveolar fluorocarbon levels after one discharge of the inhaler were only 4.0 and 1.4% of those that, when maintained for 5 min in dogs, sensitized the myocardium. The peak concentrations after repeated inhalation approached those that sensitize the dog heart to arrhythmia, although the electrocardiogram remained normal in the subject under test. Another previous experiment determined fluorocarbon levels in tissues, fat, and adrenals of rats exposed to fluorocarbons. Radioactive F11 and a gamma camera were used to determine the fate of F11 in humans. Fluorocarbons are concentrated in the fat and then slowly released into the blood at concentrations that should not cause any risk of cardiac sensitization. The concentrations required to produce cardiac sensitization in animals can only be approached in man by repeated inhalation of metered doses from a pressurized aerosol. Previous experiments on fluorocarbon ingestion are also reported. Inhalation and ingestion of fluorocarbon 115 were compared experimentally in beagles. Absorption after ingestion is some 35 to 48 times lower than that after inhalation of a fluorocarbon.

61461 **APTIC NO. 81249**

Charpin, J. and J. Orehek

BRONCHOPULMONARY REACTIONS TO AIR POLLUTANTS. *(Reactions bronchopulmonaires aux polluants atmospheriques). Text in French. Marseille Med., 112(1):47-48, 1975.*

Highlights of the Conference on Bronchopulmonary Reactions to Air Pollutants, organized by INSERM (Pont-a-Mousson, France, 1974) are presented. The main topics dicusssed at the conference were the influence of particle size and solubility of gaseous pollutants on pulmonary penetration, the roles of the morphology of the respiratory tract in the retention and elimination of air pollutants, pulmonary surfactant, and bronchial secretion, the mechanism of pulmonary self-purification, and the effects of air pollutants on experimental models in vivo and in vitro. The synergism of the different air pollutants should be studied rather than the effects of the individual pollutants.

61462 **APTIC NO. 81763**

Chen, R. W., P. D. Whanger, and P. H. Weswig

SELENIUM-INDUCED REDISTRIBUTION OF CADMIUM BINDING TO TISSUE PROTEINS: A POSSIBLE MECHANISM OF PROTECTION AGAINST CADMIUM TOXICITY. *Bioinorg. Chem., vol. 4:125-133, 1975. 13 refs.*

Mechanisms involved in protection against cadmium toxicity in rats as a result of selenium pretreatment were investigated. Selenium significantly increased the Cd content in the blood and the testes and decreased Cd levels in the liver and kidney. Selenium diverted almost all of the Cd in the soluble fraction of the testes from low molecular weight proteins to larger ones. Since the soluble fraction was the major subcellular Cd-binding component, the diversion of Cd by Se appeared to be a mechanism involved in protection against Cd-induced testicular injury. The diversion in binding of Cd in the soluble fraction to higher molecular weight proteins was also observed in the kidney and liver and appeared to be a second possible mechanism for protection against Cd toxicity. Selenium was also found in the higher molecular weight Cd-binding proteins. The Cd-binding and Se-containing proteins found in these organs appeared to be similar based on their similar molecular weights (about 115,000). A diversion of Cd from lower molecular weight proteins to larger ones by Se was also observed in the plasma, but the Cd-binding and Se-containing proteins in plasma appeared to be different from those found in the other organs since they displayed higher molecular weights. (Author abstract modified)

61463 **APTIC NO. 83340**

Cikrt, M. and V. Bencko

BILIARY EXCRETION OF 7BE AND ITS DISTRIBUTION AFTER INTRAVENOUS ADMINISTRATION OF 7BECL2 IN RATS. *(Arch. Toxicol. (Berlin), 34(3):53-60, 1975. 12 refs.*

The biliary excretion of 7 beryllium and its distribution after intravenous administration of 7 beryllium chloride (either 0.025 mg Be2+/kg b.w. or 0.25 mg Be2+/kg b.w.) in female Wister rats were investigated. Significant differences in the effect of the doses were found, particularly in the shape of biliary excretion curves of 7Be. Unproportionally higher 7Be blood levels persisted for a longer period of time after the higher dose. The decrease of 7Be in blood after the higher dose between the 5th and 24th hr after administration was accompanied by an increased content of 7Be in the liver and spleen and by increased urine excretion. The reticuloendothelial system mainly participated in Be retention. Urine represented the main excretion route of Be after a parenteral administration. (Author abstract modified)

61464 **APTIC NO. 80488**

Cogswell, J. J., D. Hull, A. D. Milner, A. P. Norman, and B. Taylor

LUNG FUNCTION IN CHILDHOOD. III. MEASUREMENT OF AIRFLOW RESISTANCE IN HEALTHY CHILDREN. *Brit. J. Diseases Chest (London), vol. 69:177-187, July 1975. 13 refs.*

Indices of measurement of airflow resistance were obtained in 248 healthy London schoolchildren. Measurements are presented of peak expiratory flow rate, the forced expiratory volume in 0.75 seconds, the maximum mid-expiratory flow rate, and more direct indices of airway resistance, airway resistance estimated plethysmographically, and total respiratory resistance estimated using the forced oscillation technique.

61465 **APTIC NO. 76501**

Dehnen, Walter

STUDIES OF THE METABOLISM OF BENZO(A)PYRENE IN ALVEOLAR MACROPHAGES II. KINETICS OF METABOLISM AND CHARACTERIZATION OF THE METABOLITES. *(Untersuchungen ueber den Metabolismus von Benzo(a)pyren in Aveolarmakrophagen II. Kinetik des Abbaus und Charakterisierung der Metabolite). Text in German. Zentralbl. Bakteriol. Hyg., Infektionskr. Abt. Orig. B, 161(1):1-25, 1975. 67 refs.*

The metabolism of benzo(a)pyrene was studied in the alveolar macrophages of guinea pigs. The metabolites were separated by a column chromatographic technique using a gradient elution followed by thin-layer chromatography. Alveolar macrophages in culture produce metabolites which remain in the cells. The presence of serum in the medium modifies the kind of metabolites formed. To identify the metabolites, the products formed by liver microsomes from benzo(a)pyrene were separated and identified. The spectra of 3-OH-benzo(a)pyrene; 4,5-dihydro-4,5-dihydroxybenzo(a)pyrene; 7,8-dihydro-7,8-dihydroxybenzo(a)pyrene; and 9,10-dihydro,9,10-dihydroxybenzo(a)pyrene were identified. The characterization of labelled metabolites formed by alveolar macrophages in culture was achieved by comparison of their chromatographic behavior with that of reference metabolites obtained from liver microsomes. With the exception of the 4,5-diol all metabolites were present in extracts from alveolar macrophages. (Author abstract)

61466 **APTIC NO. 79694**

Desaedeleer, Georges G. and John W. Winchester

TRACE METAL ANALYSIS OF ATMOSPHERIC AEROSOL PARTICLE SIZE FRACTIONS IN EXHALED HUMAN BREATH. *Environ. Sci. Technol., 9(10):971-972, Oct. 1975. 17 refs.*

The particle size distribution of lead, bromine, chlorine, and calcium in exhaled aerosols from a human subject breathing normally polluted air was measured using proton induced X-ray emission analysis. Two aerosol sources were employed: chalk dust generated by blackboard erasers and lead halide aerosols generated by an automobile operating at idling speed in a semi-enclosed space. Apparent respiratory disposition fractions decreased from both small and large particle sizes to a minimum near 0.5 micron aerodynamic equivalent diameter. Minimum deposition is well under 50%, and deposition is well over 50% for smaller and larger particles. The feasibility of direct determinations of trace element respiratory depositions in human subjects breathing aerosols at ambient air concentrations was demonstrated. (Author abstract modified)

61467 **APTIC NO. 76507**

Djuric Dusan, Ljubica Graovac-Leposavic, and Svetislav Milic

EVALUATION OF LEAD-SMELTER FILTER SYSTEM BY BIOASSAY ON EXPOSED POPULATION. *Int. Arch. Occup. Environ. Health, 35(3):291-298, 1975. 13 refs.*

A lead smelter in the Meza Valley (Slovenia, Yugoslavia) has been causing heavy lead pollution since 1894. In 1969 a filter system was installed to decrease emissions. The level of lead exposure from 1968 to 1973 was investigated in 273 persons by determining the level of delta-aminolevulinic acid in urine. The results indicate that lead levels corresponded well to technologic, topographic, and meteorologic exposure variables. The efficiency of a filter system can be assessed by a cheap and simple bioassay.

61468 **APTIC NO. 84520**

Dodo, Hidenori

HEALTH EFFECTS OF AIR POLLUTION. *(Kankyohakai, tokuni taikiosen to kenko). Text in Japanese. Yamaguchi Igaku (Yamaguchi Med.), 24(4):225-229, 1975.*

A general description of air pollution and its effect on people in Hiroshima and Otake City in the western part of Hiroshima Prefecture is given. The present state of air pollution in Otake City is lower than in Kawasaki and Yokkaichi cities, according to sulfur dioxide concentration. Values from the sulfur dioxide (by lead dioxide) and electroconductivity method are comparable. The frequency of doctor visits for respiratory diseases increased yearly from 1959. Although the morbidity of babies and younger children has increased recently, there was no increase in the mortality of old people and in suckling babies. Annual BMRC questionnaires on subjective symptoms of the respiratory system suggest the effect of air pollution in some degree. The problem of lead in auto exhaust seems not to be serious. Auto exhaust is a problem in the more populated and busy city of Hiroshima. The degree of air pollution in Hiroshima Prefecture is not conspicuous; however, there is some suggestion concerning the beginning of air pollution.

61469 **APTIC NO. 80451**

Dora, E., B. Chance, A. G. B. Kovach, and I. A. Silver

CARBON MONOXIDE-INDUCED LOCALIZED TOXIC ANOXIA IN THE RAT BRAIN CORTEX. *J. Appl. Physiol., 39(5):875-878, Nov. 1975. 15 refs.*

A method for the determination of maximal reduction of nicotinamide adenine dinucleotide in the rat cerebral cortex was developed. NADH fluorescence induced by 366 nm light and ultraviolet reflectance were measured by a time sharing light pipe fluorometer. The redox state of the cortical surface was altered by perfusion of oxygen or carbon monoxide through a teflon chamber adjacent to the dura. Changes caused by local perfusion with the two gases in normoxia, hypoxia, and anoxia were examined. Alternation of topical carbon monoxide and oxygen became effective in altering the intracellular redox state at 15% inspired oxygen and caused 20% changes at zero inspired oxygen. Conversely, topical application of oxygen to the systematically anoxic tissue caused oxidation of reduced NAPH in the cells within the field of fluorometric observation equivalent to that caused by breathing approximately 8% oxygen systematically. (Author abstract modified)

61470 **APTIC NO. 83070**

Dungworth, D. L., W. L. Castleman, C. K. Chow, P. W. Mellick, M. G. Mustafa, B. Tarkington, and W. S. Tyler

EFFECT OF AMBIENT LEVELS OF OZONE ON MONKEYS. *Fed. Proc., 34(8):1670-1674, July 1975. 25 refs.*

Studies of ozone toxicity were designed to provide information about the pathogenesis and nature of the effects of ozone at levels attained in smoggy environments. Monkeys were housed individually in 21 cu ft chambers provided with filtered air and maintained at 77 + or - 3 F with relative humidity below 60% during seven daily exposure periods and for two prior conditioning periods. Significant clinical changes were limited to higher respiratory rates for the first three exposures in rhesus monkeys and the two bonnet monkeys exposed to 0.5 ppm. One lung of each monkey was fixed for morphology and the other used for biochemical determinations. Activity of succinate oxidase, glutathione peroxidase, and other enzymes measured increased in exposed monkeys, with a greater effect from higher ozone concentrations. Neither gross lesions nor significant differences in lung to body weight ratios and displacement volumes of lungs occurred in exposed animals. The most obvious and consistent microscopically observed pulmonary lesion in exposed monkeys occurred in respiratory bronchioles. Epithelium lining alveoli in the walls of respiratory bronchioles was thickened. Trachea and bronchi also were affected at all exposure levels. A seven-day intermittent exposure for 8 hr a day to as low as 0.2 ppm ozone, which can be experienced fairly frequently between 9:00 am and 5:00 pm during summer months in parts of the South Coast Basin, consistently produced mild damage to the conducting airways and respiratory bronchioles of bonnet monkeys.

61471 **APTIC NO. 80553**

Ehrlich, Richard, Elaine Silverstein, Robert Maigetter, James D. Fenters, and Donald Gardner

IMMUNOLOGIC RESPONSE IN VACCINATED MICE DURING LONG-TERM EXPOSURE TO NITROGEN DIOXIDE. *Environ. Res., 10(2):217-223, Oct. 1975. 8 refs.*

Swiss albino mice were continuously exposed to either 2 ppm nitrogen dioxide, 0.5 ppm NO2 with daily 1 hr peaks of 2 ppm NO2, 5 days a wk, or to filter air. The mice were vaccinated with A2/Taiwan influenza virus vaccine after a 12 wk exposure, and the exposures to the various environmental conditions continued for an additional 28 wk. The serum neutralizing (SN) antibody titers and SN seroconversion rates were depressed to various extents in mice exposed to NO2 at 2 wk after vaccination. The SN antibody titers did not differ significantly among the various groups at 4 wk after the vaccination and later. Nonvaccinated mice exposed to NO2 for 12 wk showed a marked decrease in concentrations of serum (immunoglobulin) IgA, and an increase in serum IgM, IgG1, and IgG2 immunoglobulins. When concentrations of immunoglobulins were adjusted for age of mice after vaccination, a significant elevation was observed in serum IgM, IgG1, and IgG2 of mice exposed to NO2 as compared to controls. Exposure to NO2 appeared to be the predominant factor influencing the percentage concentration of the four serum immunoglobulins during the 2 wk period immediately following the vaccination. (Author abstract)

61472 **APTIC NO. 84143**

Einbrodt, H. J., J. Rosmanith, F. J. Dreyhaupt, and A. Schroeder

THE INFLUENCING FACTORS OF SELECTION OF COLLECTIVE UPON THE ASSESSMENT IN EPIDEMIOLOGICAL STUDIES IN THE EXAMPLE OF BLOOD LEAD LEVELS IN CHILDREN. *(Einfluesse der Kollektivauswahl auf die Bewertung bei epidemiologischen Untersuchungen am Beispiel des Blutbleispiegels bei Kindern). Text in German. Zentralbl. Bakteriol Hyg., Infektionskr. Abt. Orig. B., 161(1):38-45, 1975. 22 refs.*

Blood samples were taken from a group of 1033 children, 2-14 yr of age, from a densely populated industrial region in Northrhine-Westphalia with a high lead pollution level. Lead determination of the blood was performed by atomic absorption spectroscopy. The results were statistically evaluated. The highest blood lead levels were found in pre-schoolchildren during the spring, and were assumed to be traceable to playing outdoors. Veterinarians also noticed more frequent lead poisoning of grazing cattle due to higher storage of Pb in growing grass. It was established that for epidemiological in-

vestigations, random selection of participants provides the most faithful statement on the load of a population group. The highest Pb-level expressed in microgram/100 ml of blood was higher than 50, and was seen in 2.4% of the 495 children living in an area with a source of emission.

61473 **APTIC NO. 84516**

Endo, R., Y. Nomura, T. Tanabe, H. Yamagata, K. Tanaka, and M. Shimizu

HEALTH SURVEY ON POLICEMEN AND POLICEWOMEN ON OUTSIDE DUTY. *(Gaikin keisatsukan no kenko chosa ni tsuite). Text in Japanese. Yamaguchi-ken Eisei Kenkyusho Nenpo (Ann. Rept. Yamaguchi Prefect. Inst. Health), no. 17:73-74, 1975.*

Determination of lead content of blood, questionnaires on subjective symptoms and physico-chemical examination of urine and blood were carried out in 1974 as in 1972 and 1973, on 1003 policemen and 42 policewomen in Yamaguchi Prefecture. The results were: (1) the frequency of physical fatigue syndrome was 18.1%, that of mental fatigue syndrome was 21.0%, (2) urinalysis showed male positivity of 3.6% for protein, 7.8% for sugar and 19.0% for urobilinogen and female positivity of 19.0% for urobilinogen, (3) lead in blood showed no age difference and was higher in males than in females, with 3 cases of more than 30 microgram/dl withou anemic tendencies, the highest value being 43.3 microgram/dl, (4) blood density was normal in 95.5% of males and in 85% of females, (5) hemoglobin and hematocrit percentages were almost normal, and (6) blood sugar showed higher values than normal; however, the blood sampling was carried out relatively sooner after meals. Thus, health disturbances due to lead in auto exhaust were not found in policemen and women on outdoor duty.

61474 **APTIC NO. 83710**

Ernst G. Beck

FIBER QUANTITIES ARE DIFFICULT TO MEASURE. *(Fasermengen sind schwer zu messen). Text in German. Umwelt (Duesseldorf), 5(4):29-31, 1975. 2 refs.*

In considering the relationship between particulate air pollutants and health there arises the question of non-settling inhalable dust. It is extremely difficult to evaluate the biological effects of dust emissions on account of the many physicochemical forms of pollutants. Since the 30 s the danger of working with asbestos has been known with respect to asbestosis, mesothelioma, and respiratory and digestive carcinomas. Clinical epidemiological research has shown a significant incidence of mesothelioma and lung tumors for municipalities with asbestos mines and mills in people who never worked at all in the asbestos industry. Animal experimentation has demonstrated the carcinogenicity of long fibers with very small diameters irrespective of the material (asbestos or glass fibers). A very important problem is technological epidemiology, or the establishment of emission registries. Along with the development of more sensitive optical equipment, automatic and quantifying fiber-counting methods should be sought.

61475 **APTIC NO. 80193**

Eschner, E.

COMPLEX EFFECT OF AIR POLLUTION ON HUMANS FROM THE VIEWPOINT OF SOCIAL MEDICINE. *(Gesamteinwirkung von Luftverunreinigung auf den Menschen aus der Sicht der Sozialmedizin). Text in German. Praxis Pneumol., vol. 28:749-757, 1974.*

Air pollution as a general pathogenic factor is discussed on the basis of epidemiological surveys conducted in different countries. The increased incidence of bronchitis and lung cancer can be related to air pollution, since these incidences are generally higher in industrial and urban areas with high air pollution level than in rural regions. Different epidemiological surveys conducted among adults and children in different countries revealed increased incidence of respiratory diseases, including rachitis, pneumonia, bronchopneumonia, skin allergy, and asthma in polluted areas. Reduced erythrocyte count and retarded bone growth were also observed in children. While smoking and air pollution have nearly additive effect, the former is a more serious pathogenic factor than air pollution in general.

61476 **APTIC NO. 80012**

Ettema, Jan H., Loes Kleerekoper, and Wim C. Duba

STUDY OF MENTAL STRESSES DURING SHORT-TERM INHALATION OF TRICHLOROETHYLENE. *Staub, Reinhaltung Luft, 35(11):409-412, 1975. 1 ref.*

Adult male volunteers were exposed to trichloroethylene for 2.5 hours. Eleven subjects were exposed to 75 ppm, 11 to 300 ppm, and a control group of 11 was not exposed. In a second series of experiments, 16 subjects were exposed to 150 ppm and 15 to 300 ppm. The subjects had to perform some mental tasks during exposure. Performance and some physiological parameters, such as pulse rate, breating rate, and sinus arrhythmia were recorded. Of these, only sinus arrhythmia was much affected. There was an indication of greater suppression of sinus arrhythmia in rest and while performing mental tasks, indicating a greater functional exertion to perform the same task as a result of inhalation of trichloroethylene. (Author abstract)

6147 **APTIC NO. 80123**

Exon, J. H. and L. D. Koller

EFFECTS OF FEEDING MANGANESE ANTIKNOCK GASOLINE ADDITIVE EXHAUST RESIDUES (MN3O4) IN RATS. *Bull. Environ. Contamination Toxicol., 14(3):370-373, Sept. 1975. 8 refs.*

The effects of feeding manganese antiknock gasoline additive exhaust residues (manganous manganic oxide) to rats were investigated. Animals consumed from 4 mg to 8900 mg Mn3O4/kg body wt daily for 1 mo without suffering mortalities or apparent tissue damage. Body weights of animals receiving 200, 2000, and 20,000 ppm Mn3O4 increased during the exposure period, but growth rates progressively decreased. Rats which received 200,000 ppm Mn3O4 in the feed lost weight throughout the experiments partially due to decreased consumption. Manganous manganic oxide is a relatively non-toxic compound when consumed and does not warrant extensive investigation as an acutely hazardous environmental contaminant.

61478 **APTIC NO. 79596**

Fairchild, Glen A., Phillip Kane, Betty Adams, and David Coffin

SULFURIC ACID AND STREPTOCOCCI CLEARANCE FROM RESPIRATORY TRACTS OF MICE. *Arch. Environ. Health, 30(11):538-545, Nov. 1975. 16 refs.*

The relationship of sulfuric acid aerosol and the pathogenesis of respiratory disease was investigated. The inhalation of 15 micrograms/cu m of H2SO4 aerosol for 4 hr after exposure to radioactive aerosol reduces the rate of clearance of nonviable streptococci from the lungs and noses of mice. A second exposure to H2SO4, lasting 90 min (15 micrograms/cu m) for 4 days prior to the radioactive aerosol reduces the rate of clearance of nonviable streptococci from the noses but not the lungs. Neither of these exposure regimens cause an alteration in the rate of reduction of viable streptococci from the lungs or noses. Inhalation of 1.5 micrograms of H2SO4 for 4 daily 90-minute exposures, prior to, or for 4 hr after exposure to Streptococcus causes no alteration in the normal rate of clearance of viable or nonviable streptococci from the noses or lungs. (Author abstract modified)

61479 **APTIC NO. 81433**

Fassbender, Christian P.

THE IMPORTANCE OF THE HEAVY METAL CADMIUM IN ENVIRONMENTAL HYGIENE. *(Zur Um-*

welthygienischen Bedeutung des Schwermetalls Cadmium). Text in German. Forum Umwelthyg., 1(6):168-170, 1975. 28 refs.

General environmental and toxicological aspects of cadmium are reviewed. The background concentrations are 0.01-1 ppm in soil, and 0.2-0.5 ppm in plants. In industrial areas, these levels may increase to 100 ppm in soil, and to 1 ppm in plants. Most of the cadmium is taken up by man orally, in contaminated food, and in cigarette smoke. Hair is a reliable indicator of chronic subclinical exposure to cadmium. Osteoporosis, osteomalacia, kidney lesions, hypochromic anemia, increased serum gamma- globulin level, albuminuria, and interferences with sulfhydryl and zinc-containing enzymes and delta-aminolevulinic acid synthetase are the major effects of cadmium. It was teratogenic and embryotoxic. Correlation was established between the incidence of hypertensive and arteriosclerotic diseases and the cadmium content in the air.

61480 **APTIC NO. 76381**

Fischer, Anna Barbara

THE EFFECT OF LEAD ON CELLS CULTIVATED IN VITRO. I. ACUTE EFFECTS. *(Einfluss von Blei auf in vitro gezuechtete Zellen I. Akute Wirkungen). Text in German. Zentralbl. Bakteriol. Hyg., Infektionskr. Abt. Orig. B, 161(1):126-137, 1975. 57 refs.*

Static suspension cultures of L-A cells, a subline of L 929 mouse fibroblasts, were exposed to inorganic lead salts. Lead caused a growth inhibition that was independent of the anion used and that could be prevented by the addition of Ca-EDTA. The LD subscript 50 was about 1mM when cells were exposed for 2 days. 0.0002 M when exposed for 7 days. The minimal growth inhibiting dose was in the range of 0.00002 to 0.00004 M. The mitotic rate and the fraction of cells synthesizing DNA decreased to a degree similar to the decrease in cell proliferation. This suggests a block in the G1 phase of the cell cycle. A rise in lactate production indicates an effect on energy metabolism. Lactate dehydrogenase release was in the control range. Lead induced an increase in cell size, and at higher concentrations, an increase of cellular vacuolations.

61481 **APTIC NO. 84101**

Franzen, E.

ELECTROPHORESIS AND OTHER PROTEIN-BIOCHEMICAL SEPARATION TECHNIQUES IN INDUSTRIAL MEDICINE. A SURVEY OF THE LITERATURE COVERING 1951-1970. *(Elektrophoretische und andere trennmethoden der Proteinbiochemie in der Arbeitsmedizin-Literatureuebersicht 1951 bis 1970). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 21(7):517-523, 1975.*

Acting on man and animals, physical and chemical agents alter the protein make-up of organs and body fluids. Physical influences include climate, noise, vibrations, radiation. Among the chemical influences are dust, metals and metalloids, organic solvents, acids and lyes, pesticides, and plastics. Separation techniques employed to prove exposure include carrier electrophoresis (paper; cellulose; acetate membranes; pectin; and starch, agar and polyacrylamide gels), immunodiffusion, and immunoelectrophoresis. Plasma, serum and protein-free fluids, as well as examination of the liver, lungs and muscles. Results obtained from the period 1951-1970 in toxicology and industrial medicine with the described protein separation techniques are presented and critically evaluated.

61482 **APTIC NO. 80494**

Fraumeni, Joseph F., Jr.

RESPIRATORY CARCINOGENESIS: AN EPIDEMIOLOGIC APPRAISAL. *J. Nat. Cancer Inst., 55(5):1039-1046, Nov. 1975. 98 refs.*

Although cigarette smoking is the major cause of respiratory neoplasms throughout the world, the contribution of hydrocarbons and other potential carcinogens in tobacco smoke remains to be clarified. Industrial exposures, which account for a relatively small portion of respiratory cancers in the general population, have been the primary means for identifying chemical carcinogens in man. The epidemiologic evidence for factors other than smoking in respiratory carcinogenesis is reviewed. Occupational agents discussed include radioisotopes, mustard gas, asbestos, polycyclic aromatic hydrocarbons, halo ethers, nickel, chromium, inorganic arsenic, hematite, wood dust, the shoe industry, and isopropyl oil. Industrial chemicals are not necessarily restricted to the workplace. Cigarette smoking greatly enhances the risk of lung cancer after asbestos exposure. Alcohol consumption predisposes to cancers, and a dietary survey of men with lung cancer revealed a negative association with an index of vitamin A intake. The relationship of drugs and genetic and immunologic susceptibility to cancer is also discussed.

61483 **APTIC NO. 82718**

Freudenthal, R. I., G. A. Lutz, and R. I. Mitchell

CARCINOGENIC POTENTIAL OF COAL AND COAL CONVERSION PRODUCTS. *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., 37p., Feb. 25, 1975. 79 refs.*

A literature analysis of the carcinogenic potential of coal and coal conversion products resulting from coal mining, coking (carbonization), gasification, liquefaction, and solvent refining processes is presented. Although some groups of coal miners exhibit a higher than average incidence of stomach cancer, socioeconomic factors rather than occupational factors may be involved. The carcinogenic risk facing workers in coking plants, on the other hand, is well documented. However, additional research is needed to establish the effect, if any, of coke oven gases. Liquefaction, gasification, and solvent refining processes all probably involve at some point in their process streams compounds that must be regarded as potential carcinogens or cocarcinogens. Such compounds include various hydrocarbons and sulfur compounds. The role, if any, that carbon monoxide and sulfur compounds might play in cocarcinogenicity is not established. In general, any stage in a process where high boiling coal-derived liquids or their vapors may escape must be regarded as a source of hazard to the worker.

61484 **APTIC NO. 76193**

Friberg, Iars, Pamela Boston, Gunnar Nordberg, Magnus Piscator, and Karl-Henrik Robert

MOLYBDENUM - A TOXICOLOGICAL APPRAISAL (FINAL REPORT). *Karolinska Inst., Stockholm (Sweden), Dept. of Environmental Hygiene and National Environmental Protection Board, Stockholm (Sweden), Environmental Protection Agency Contract 68-02-1210, Program Element 1AA001, Rept. EPA-600/1-75-004, 148p., Nov. 1975. 233 refs.*

A toxicological appraisal of molybdenum is presented based on animal laboratory studies and observations of human exposure. Topics covered include: analytical methods for the determination of molybdenum; the production, uses, and occurrence of molybdenum; the uptake and absorption of molybdenum in animals and humans; the excretion of the element in animals and humans; the role of molybdenum as an essential element in animal nutrition; and the toxicological effects of different exposures (dosages and routes) of molybdenum in animals and humans. Information on the possible toxic effects of the metal in humans is scarce, though data from Russian literature suggests that exposure to some molybdenum dusts may give rise to pulmonary disorders in the form of pneumoconiosis. Similar effects can be reproduced in animals.

61485 **APTIC NO. 76062**

Friberg, Lars, Tord Kjellstrom, Gunnar Nordberg, and Magnus Piscator

CADMIUM IN THE ENVIRONMENT - III. A TOXICOLOGICAL AND EPIDEMIOLOGICAL APPRAISAL

(FINAL REPORT). Karolinska Inst., Stockholm (Sweden), Environmental Protection Agency Contract 68-02-1210, Program Element 1AA001, ROAP 26AAA-066, Rept. EPA-650/2-75-049, 218p., June 1975. 281 refs.

NTIS: PB 246115/AS

A toxicological and epidemiological appraisal of cadmium in the environment is presented based on biomedical literature mostly from the period 1973-1974. Topics covered in the review include: problems associated with the analysis of cadmium in air samples and biological tissues, routes of exposure to cadmium, the uptake of cadmium by plants, respiratory deposition and gastrointestinal absorption of cadmium by animals and humans, placental transfer of cadmium, cadmium distribution and retention in tissues, interactions between cadmium and other metals or compounds, the clearance of cadmium from the blood, the excretion of cadmium via the urine, and the effects of acute and prolonged exposures to cadmium on various human tissues and organs. Studies of highly exposed human populations are also cited.

61486 **APTIC NO. 83932**

Fruhmann, G.

SMOKE, DUST AND OTHER ENVIRONMENTAL PATHOGENIC FACTORS IN THE GENESIS OF CHRONIC OBSTRUCTIVE RESPIRATORY DISEASES. *(Rauch, Staub und andere umweltbedingte Krankheitsfaktoren fuer die Entstehung chronisch obstruktiver Atemwegserkrankungen). Text in German. Therapiewoche, 25(30):4023-4030, 1975. 17 refs.*

The effect of high dust concentrations in the atmosphere over a period of years represents a limited cause for the development of non-specific bronchial disorders. The smoking of tobacco seems to be a greater influence. No uniformity could be determined in results of epidemiological research on the comparative frequency of respiratory diseases in industrial areas and rural districts. Further research shows a high mortality rate for pulmonary and bronchial diseases in increased immersion of suspended particles in outside air. Intoxication by poisonous gases rarely leads to chronic bronchopulmonary disorders. The antigenicity of substances in consumer goods should be considered valuable in preventing respiratory diseases.

61487 **APTIC NO. 76552**

Fujii, M.

EXISTENCE OF BENZO-A-PYRENE. PART I. ENVIRONMENTAL ATMOSPHERE. *(Benzopiren no sonzai (1): Kankyo taiki). Text in Japanese. Gendai Kagaku (Mod. Chem.), no. 55:55-58, Oct. 1975.*

Studies on the carcinogenic effect of condensation polynuclear hydrocarbons, and particularly benzo-a-pyrene (bap), are reviewed chronologically. The complexity of the carcinogenicity and effects on human health are discussed. Air pollution by polynuclear HC and its relationship with carcinogenicity are also discussed with an analysis of relationships between air pollution and death rate by cancer. Studies and data on air pollution by polynuclear HC, particularly bap, are reviewed with descriptions of emission sources. Studies on the atmospheric distribution of bap are also reviewed.

61488 **APTIC NO. 80157**

Fujimoto, K., K. Minaki, Y. Yano, M. Sakan, S. Yoshimatsu, and Y. Nose

EFFECTS OF RECENT AIR POLLUTION ON THE HEALTH OF INHABITANTS IN UBE CITY. *(Saikin no Ubeshi no taikiosen ga shimin no kenko ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):503, Nov. 1975.*

The results of an epidemiological survey on the relationship between air pollution and health in the Ube City, where sulfur oxides and dust fall decreased and nitrogen oxides increased recently are given. The distribution frequency of complaints about irritation and odor of gases decreased in Aug. 1973 compared to July 1970. The local difference in complaints about damage and injuries due to gases and odor was positively proportional to the local difference in the degree of air pollution. The regression curve of the time change of the ratio of nitrogen oxides to sulfur oxides and the regression curve of the time change of the ratio of heart disease to the mortality due to pneumonia and bronchitis showed a complete parallelism with monthly increase. These results suggest the necessity of establishing nitrogen oxide countermeasures as does the fact that deaths due to heart disease cluster around factories.

61489 **APTIC NO. 82258**

Fukase, O., K. Isomura, and H. Watanabe

EFFECT OF OZONE ON VITAMIN C IN VIVO. *(Ozon on seitainai bitamin C ni oyobosu eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(2):63-66, 1975.*

After acute inhalation exposure to ozone at concentrations greater than 1.2 ppm (1.2, 2.0, 4.0 and 8.2 ppm) for 4 hours, the vitamin C content of the lungs of exposed mice showed a rapid decrease which could be used as a sensitive indicator of the acute action to ozone. The level of vitamin C returned to the original level 24 hours after the exposure. In another experiment, with repeated exposure to ozone at lower levels (0.2-1.0 ppm, 4 hr/day for 30 days) the level of vitamin C showed progressive increase; not, however, so conspicuously as the increase of glutathione. The administration of vitamin C (0.1 m mole/mouse, once before each exposure) suppressed the effects of ozone exposure.

61490 **APTIC NO. 84694**

Fukuda, M.

EXPERIMENTAL STUDIES ON LYSOZYME IN TEARS USING AN ARTIFICIAL SMOG CHAMBER. *(Smog chamber ni yoru namida-lysozyme ni kansurujikkenteki kenkyu). Text in Japanese. In: Report on the Results of Studies on Environmental Pollution II. Tokyo Metropolitan Public Health Research Lab. (Japan), p. 16-18, July 1975.*

Five subjects were exposed to acrolein at 2 ppm for 5 min and 14 subjects were exposed to auto exhaust irradiated by ultraviolet light, and their tears were collected in sheets of filter papers. The filter paper and another filter paper containing standard lysozyme were placed on agar plates containing Micrococcus lysodeikticus, then after in an incubation for 6 hr at 37 C, the lysozyme was determined from the diameter of lysis-zone. The activity of lysozyme decreased conspicuously just after acrolein exposure and recovered considerably after 1 hr. In the case of irradiated autoexhaust, on the contrary, the activity increased a little and returned to the original value after 3 hr. The volunteers pain in eyes was 100% using acrolein, and 39.3% using irradiated exhaust.

61491 **APTIC NO. 76329**

Gliner, Jeffrey A., Peter B. Raven, Steven M. Horvath, Barbara L. Drinkwater, and J. Connor Sutton

MAN S PHYSIOLOGIC RESPONSE TO LONG TERM WORK DURING THERMAL AND POLLUTANT STRESS. *J. Appl. Physiol., 39(4):628-632, Oct. 1975. 20 refs.*

The physiologic response of man to long-term work during thermal and pollutant stress was investigated. Metabolic, temperature, and cardiorespiratory responses of 19 healthy males, age range 18-30 and 40-55 were studied during 210 min submaximal work at 35% mean maximal aerobic power. The subjects were exposed to filtered air (FA), 50 ppm carbon monoxide in filtered air, 0.24 ppm peroxyacetyl nitrate in filtered air (PAN), and a combination of all three mixtures (PANCO) at 25 and 35 C. In the CO exposure the heart rate was significantly greater during FA conditions. Metabolic and thermoregulatory responses to long term work were not different in the various pollutant environments. There were significant decreases in stroke volume and increases in heart rate at 25 C with no alteration in cardiac output. Heart rates were higher during 35 C exposures while cardiac output remained at the same level with a consequent further reduction in stroke output. (Author abstract modified)

61492 **APTIC NO. 82457**

Gofmekler, V. A., B. D. Lishchinskiy and L. N. Kamynina

EFFECT OF AIR POLLUTANTS ON THE RESPIRATORY FUNCTION IN CHILDREN. *(O vliyanii atmosfernykh zagryazneniy na funktsiyu vneshnego dykhaniya u detey). Text in Russian. Gigiena i Sanit., no. 3:114-116, 1975. 2 refs.*

Different parameters of the respiratory function were studied in 5-7-year-old children (boys and girls). One test group was permanently exposed to very low air pollution level at 500 m distance from the port of Vladivostok, and another lived at about 250 m distance from the port where the pollution level exceeded the maximum allowable levels. Air pollution was due to carbon monoxide, nitrogen dioxide, and sulfur dioxide emitted by ship engines. A slight impairment of the parameters of the respiratory function was observed in children living in the polluted area as compared with a control group and with the group living at 500 m distance from the port. A reduction of the respiratory capacity of the lungs and of the minute volume, and an increase in the vital capacity, in the inspiratory reserve volume, and in the expiratory reserve volume were observed in children living in the polluted area. Low pollutant concentrations can be considered as stimulating the respiratory organs.

61493 **APTIC NO. 76414**

Goldman, S. and M. Acketa

SURVEY METHODS FOR CHRONIC BRONCHITIS IN YUGOSLAVIA. *(Methodes d enquete sur la bronchite chronique en Yougoslavie). Text in French. Bronches, 25(2):136-147, 1975.*

Epidemiological survey methods applied in Yugoslavia to determine the incidence of chronic bronchitis and other respiratory diseases are described, and results of some surveys on chronic bronchitis in different industries are presented. The short form of the standard BMRC questionnaire, and a combination of the BMRC, CECA and Ulmer questionnaires are used. The clinical examinations include spirographic test, complementary functional tests, X-raying, ECG, and blood pressure test. A similar survey conducted among 898 workers of a cement works revealed chronic bronchitis in 25.2% of the workers, and obstructive functional disturbances in 7.3%. Another survey conducted among 398 workers exposed to hops, sorghum and hemp revealed an incidence of 60.6% for respiratory disturbances, 30.2% for chronic bronchitis, and 3.9% for bronchial asthma. The incidence of chronic bronchitis was determined to be 31.4% in foundry workers. This rate was considerably lower in the textile industry (6.7%), in machine shops (7.8%), and in the typographic industry (2%).

61494 **APTIC NO. 83003**

Goldstein, Bernard D.

ASSESSMENT OF THE HEALTH EFFECTS OF STATIONARY SOURCE FOSSIL FUEL COMBUSTION PRODUCTS. *Preprint, New York Univ. Medical Center, 12p., 1975. (Presented at the Engineering Foundation Workshop on Risk-Benefit Methodology and Application, Asilomar, Calif., Sept. 22, 1975.)*

Approaches utilized to identify and quantitate risks associated with exposure to stationary source fossil fuel combustion products are discussed. These techniques all provide information leading to the determination of dose-response curves and expected adverse health effects at given pollution levels. A necessary approach to understanding the effects of air pollutants is the performance of studies in laboratory animals. Such studies are particularly useful in determining long-term chronic effects and in evaluating parameters of tissue toxicity that cannot be studied in humans. Dose-response curves obtained in animal experiments are not to be directly extrapolated to humans because of presumed species differences, but they do provide an indication of possible levels of adverse consequences and also permit establishment of a hierarchy of effects for different pollutants. Sulfuric acid is a far more potent bronchoconstrictive agent than is sulfur dioxide, but techniques capable of measuring ambient sulfuric acid levels have only recently been available. The toxicological implications of various particulate sulfates differ greatly. The relatively warm and moist respiratory tract represents a special situation in which inhaled sulfur dioxide and particulates might possibly interact to form acid sulfates, thereby producing toxicity not ascribable to either ingredient alone. A major physiological reason for the lack of effect of sulfur dioxide in controlled exposure situations is that this highly soluble gas is readily absorbed in the upper respiratory tract. Controlled exposure studies have shown that there is a marked increase in the bronchoconstrictive effects of mixtures of sulfur dioxide and ozone as compared to exposure to either pollutant alone under conditions of light exercise in healthy humans.

61495 **APTIC NO. 84416**

Goodman, G. T.

HOW DO CHEMICAL SUBSTANCES AFFECT THE ENVIRONMENT? *IPIECA, Petrol. Environ. Conserv. Symp. Rep., Tehran, Iran, 1975, p. 271-312. 36 refs. (April 7-9, Paper 10.)*

Chemical effects on man occur from ingesting contaminated air, water, food, or directly from drugs or contact, causing human health problems. Absorption from contaminated air or from direct chemical treatment reduces productivity of livestock, crops, or to other cultivated species. Chemical contamination of the atmosphere and lower stratosphere by trace gases and aerosols affect global radiation balance and climate, causing sea level changes and vegetation changes.

61496 **APTIC NO. 76383**

Graef, W., H. Eff, and S. Schormair

LEVELS OF CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS IN HUMAN AND ANIMAL TISSUES. *(Kanzerogene, polyzyklische aromatische kohlenwasserstoffe in menschlichen und tierischen Organgeweben). Text in German. Zentralbl. Bakteriol. Hyg., Infektionskr. Abt. Orig. B, 161(2):85-103, 1975. 27 refs.*

The mean content of benzpyrene in human pulmonary tissue was 0.2 microgram/100 g dry tissue. The concentration differs with the individual s age: maximum concentrations are found in infants, the levels decline in the medium age groups, and the levels rise once more with increasing age. No increase in the 3,4-benzpyrene levels above the mean were found in tissues with high cellular proliferative activity, such as exocrine and endocrine glands. In human adipose tissue, as well as that of pork and beef, the 3,4-benzpyrene levels are very low, with concentrations of 0.1 microgram/100 g (markedly below the organ tissue levels). Both in man and in animals (pigs and fowls), the 3,4-benzpyrene levels consistently exceed average values during early postnatal life. This relatively high concentration in early infancy is due to exogenous factors and is not the expression of biogenous synthesis, as has been demonstrated in the study of the environmentally influenced embryonic development of chicks. Throughout the entire development of the embryo within the hen s egg, the benzpyrene levels remain constant, rising significantly only after hatching. Thus, the low 3,4-benzpyrene levels detected in all human and animal organ tissues prove to be the result of the interplay of exogenous environmental loading and individual capabilities for eliminating the substance.

61497 **APTIC NO. 83445**

Graham, Judith A., Donald E. Gardner, Frederick J. Miller, Mary J. Daniels, and David L. Coffin

EFFECT OF NICKEL CHLORIDE ON PRIMARY ANTIBODY PRODUCTION IN THE SPLEEN. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, 14p., 1975. 18 refs.*

Female Swiss mice which were immunized intraperitoneally with sheep erythrocytes were treated with nickel chloride (a common particulate air pollutant); and primary antibody production in the spleen was examined using a hemolytic plaque technique. A negative linear dose-response relationship was observed between the logarithm of plaques/million cells and the nickel concentration administered. Mice injected with 3.09 micrograms Ni/g body weight displayed lymphocyte function similar to that of control mice. However, the injection of 9.26-12.34 micrograms Ni/g caused significant immunosuppression. (Author abstract modified)

61498 **APTIC NO. 83184**

Grimaud, C.

CHRONIC OBSTRUCTIVE BRONCHOPNEUMOPATHIES. *(As broncopneumopatias obstrutivas chronicas). Text in Portuguese. Jornal Medico. (Oporto, Port.), 87(1651):547-551, 1975.*

The definition, epidemiology, etiology, and physiopathological mechanisms of chronic obstructive bronchopneumopathies, more specifically, various types of emphysema (centrolobular, panlobular, and experimental) and chronic bronchitis were studied. Exogenous etiological factors were identified as tobacco, air pollution, industrial pollution, climate, socioeconomic conditions, and infection. Of these, tobacco was considered the most significant irritant, causing hypertrophy and hyperactivity of the glands and the mucous cells and the obstruction of peripheral air ducts. Infection was viewed as a secondary factor contributing to chronic obstructive bronchomopathies. Among the endogenous factors, heredity appeared to intervene in some cases. A deficiency in alpha-l- anti-trypsyn or a history of allergy was rarely found to be a significant factor. The physiopathological mechanisms involved in the diseases studied were identified as bronchial obstruction caused by an increase of the glandular mass, obstruction by mucous, permanent and parietal lesions, and the loss of pulmonary elasticity; bronchial hypersecretion; distal distension; and the destruction of the alveolar walls and of their elastic nature.

61499 **APTIC NO. 84233**

Gylseth, Bjorn and Jorgen Jahr

SOME HYGIENIC ASPECTS OF WORKING IN ALUMINUM REDUCTION POTROOMS WITH SPECIAL REFERENCE TO THE USE OF ALUMINA FROM THE DRY- CLEANING PROCESS OF SODERBERG POT-GASES. *Staub, Reinhaltung Luft, 35(12):430-432, 1975. 6 refs.*

An increase in subjective symptoms such as irritation of the mucous membranes, headache, and nausea was registered by the workers in an aluminum reduction plant when the alumina from a dry-regaining construction (secondary alumina) was used. There was a statistically significant difference between the working conditions in the potrooms using the secondary alumina. The difference was related to airborne dust as well as gaseous and particulate fluorides. The content of potential carcinogenic polynuclear aromatic hydrocarbons (PAH) in the secondary alumina and in some airborne dust samples was determined by gas chromatography in the cyclohexane soluble fraction of these samples.

61500 **APTIC NO. 80468**

Hackney, Jack D., William S. Linn, Ramond D. Buckley, Eugene E. Pedersen, Sarunas K. Karuza, David C. Law, and D. Armin Fischer

EXPERIMENTAL STUDIES ON HUMAN HEALTH EFFECTS OF AIR POLLUTANTS. I. DESIGN CONCENTRATIONS. *Arch. Environ. Health, 30(8): 373-378, Aug. 1975. 29 refs.*

Guidelines for conducting experimental studies on human health effects of air pollutants are discussed. Such studies require rigorous control and comprehensive documentation of the experimental air environment and exposure conditions to ensure that results are both reliable and relevant to public health questions. In addition to biochemical, behavioral, and clinical evaluations, comprehensive pulmonary testing is required to assure that effects at different levels of the respiratory tract are detected. An experimental design based on these principles is described. Studies using this design show a wide range of sensitivity to the pollutant ozone and important adverse health effects in sensitive individuals under exposure conditions similar to those experienced during ambient pollution episodes. (Author abstract modified)

61501 **APTIC NO. 80357**

Hackney, Jack D., William S. Linn, John G. Mohler, E. Eugene Pedersen, Peter Breisacher, and Anthony Russo

EXPERIMENTAL STUDIES ON HUMAN HEALTH EFFECTS OF AIR POLLUTANTS. II. FOUR-HOUR EXPOSURE TO OZONE ALONE AND IN COMBINATION WITH OTHER POLLUTANT GASES. *Arch. Environ. Health 30(8):379-384, Aug. 1975. 14 refs.*

Eight adult male volunteers were exposed to ozone alone and then in combination with nitrogen dioxide and carbon monoxide under conditions simultating ambient air pollution exposures. Four normal men showed few or no effects from repeated exposures. Four male volunteers with a history of hyperreactive airways, but with normal base line pulmonary function spirometric studies, developed definite symptoms and decrement in pulmonary function after exposure to O3. (Author abstract)

61502 **APTIC NO. 80467**

Hackney, Jack D., William S. Linn, David C. Law, Sarunas K. Karuza, Howard Greenberg, Ramon D. Buckley, and E. Eugene Pedersen

EXPERIMENTAL STUDIES ON HUMAN HEALTH EFFECTS OF AIR POLLUTANTS. III. TWO-HOUR EXPOSURE TO OZONE ALONE AND IN COMBINATION WITH OTHER POLLUTANT GASES. *Arch. Environ. Health, 30(8):385-390, Aug. 1975. 8 refs.*

Adult male volunteers were exposed to ozone at 0.25, 0.37, or 0.50 ppm and to O3 in combination with nitrogen dioxide and carbon monoxide, with secondary stresses of heat, intermittent light exercise, and repeated exposure. There were few important physiological changes, and only mild symptoms with 0.25 ppm O3, 0.25 ppm O3 plus 0.30 NO2, or when 30 ppm CO was added to the latter mixture. With 0.37 ppm O3, more symptoms were present and some subjects developed definite decreases in pulmonary function. With 0.50 ppm O3, most subjects had symptoms and about half showed substantial pulmonary function decrement. In reactive subjects exposed on two successive days, changes were usually greater the second day. The effects of successive exposures were cumulative. (Author abstract modified)

61503 **APTIC NO. 84712**

Haruki, Takamasa, Kinuko Tomita, and Toshio Kawaraya

AROMATIC POLYCYCLIC HYDROCARBON AMOUNT IN THE LIVING THINGS SAMPLE. NO. 1 BENZOPYRENE MEASURING METHOD. *(Seitai shiryochu hokazoku takan tankasuiso ryo. 1. Bentsu(a).pairen o sokutei hoho). Text in Japanese. Preprint,* *Japan Society of Public Health, Tokyo, p. 525, 1975. (Presented at the Japan Society of Public Health, Lecture Meeting, 34th, Yokohama, Oct. 1975, Paper 765.)*

The determination of benzo(a)pyrene in animal lung was studied. After the sample was treated with alkali and extracted, and hydrocarbons were separated and concentrated by gas chromatography, separation and concentration were done by alumina column using a normal hexane solution containing benzene as the elution liquid and each fraction was evaporated. The residue was dissolved by normal hexane and the determination was made using the fluorescence method. By using the excitation wavelength 362 nm, a fluorescence spectrum was obtained between 400 nm and 435 nm with the peaks at 405 nm and 423 nm.

61504 **APTIC NO. 83540**

Hashimoto, T.

THE RESULTS OF AN INVESTIGATION OF ENVIRONMENTAL POLLUTION BY QUESTIONNAIRE IN KANAGAWA. *(Kanagawa-min-i-ren no kogai enquete he no torikumi). Text in Japanese. Min-I-Ren Iryo (J. All-Jap. Leagues Democr. Med. Inst.), no. 43:9-10, 1975.*

The effects of air pollution on outpatients older than 18 were investigated by questionnaire during 3 days beginning in early Nov. 1974 in 8 hospitals in Kawasaki, Yokohama, Yokosuka and Kamakura in Kanagawa Prefecture. The patients were classified into those living in polluted areas and those living in non-polluted areas. Nine symptoms showed conspicuous difference of frequency: three symptoms related to photochemical smog, three symptoms of obstructive chronic respiratory diseases, and three symptoms which seemed to be caused by auto exhaust. The morbidities of these nine symptoms were more than 2-3 times greater in polluted areas than in less polluted areas. The second group of symptoms, representing chronic obstructive respiratory diseases, increased in frequency with the age of the patients.

61505 **APTIC NO. 84047**

Hashimoto, T.

CARE OF PATIENTS SUFFERING FROM ENVIRONMENTAL POLLUTION. *(Kogaibyo kanja kanri no kokoromi). Text in Japanese. Min-I-Ren Iryo (J. All-Japan Leagues Democr. Med Inst.), no 43:12-16, 1975.*

A one-year experience of special care of patients officially recognized as victims of environmental (mainly air) pollution in a hospital in an industrial zone of the Keihin area is described. About half of the patients (120-130) were periodically examined medically and were given guidance on one or two specially determined days each month. Since last June, the specially determined days were increased to twice a week. A new case history chart was established to include the record of advised living and nursing. The symptoms were classified in detail for recording the state of the disease every month. A special card was used for recording the month s symptoms. The contents of the card were transferred to the chart by a member of the environmental pollution group. A special study class was organized by the patients. Further improvements included the use of a special case history chart for clinical study of diseases due to environmental pollution.

61506 **APTIC NO. 84580**

Hayashi, H., M. Matsuno and H. Hori.

A STATISTICAL CONSIDERATION ON CORRELATIONS OF LIFE, HEALTH AND HAPPINESS OF THE JAPANESE VERSUS SOCIAL FACTORS SUCH AS AUTOMOBILES. PART 1. *(Nihonjin no jumyo, kenko, kofuku to jidosha nado no shakaiteki yoin tono sokan ni kansuru tokeiteki ichi kosatsu). Text in Japanese. Nihon Jidosha Kenkyujo Kenkyu Sokuho (Res. Lett. Japan Automob. Inst.), no. 20:1-61, Oct. 1975. 21 refs.*

Based on data collected by prefecture, the effects of several social factors on the life, the level of health, and the level of happiness of Japanese have been statistically considered. Those findings concerning air pollution and health were as follows: in the industrialized Prefectures such as Tokyo, Osaka, Kanagawa, and Aiichi, in spite of conspicuous air pollution, the frequency of residents claims was relatively small and their life span has been lengthened; in the prefectures with larger numbers of automobiles, the life-span of the prefecture is longer; the number of hospitalized patients is smaller in the more air polluted cities and prefectures, and larger in the prefectures not so developed; the mortality due to pneumonia and bronchitis was not correlated with air pollution or the number of complaints, and no correlation between the number of automobiles and diseases such as pneumonia, bronchitis, and tuberculosis could be found.

61507 **APTIC NO. 79661**

Hefner, R. E., Jr., P. G. Watanabe, and P. J. Gehring

PRELIMINARY STUDIES ON THE FATE OF INHALED VINYL CHLORIDE MONOMER (VCM) IN RATS. *Environ. Health Perspect., vol. 11:85-95, June 1975. 15 refs.*

The rate at which vinyl chloride monomer gas (VCM) is removed from the system via metabolism was determined for rats exposed to initial concentrations of VCM ranging from 50 to 1167 ppm. The rate of metabolism is 0.00804 + or - 3.40 times 10 to the -3rd power/min for exposure to concentrations of 50 to 105 ppm and is lower for exposure to concentrations of 220 to 1167 ppm. The kinetics of disappearance are first order always. Pretreatment of rats with pyrazole prior to exposure to concentrations of 65 to 1234 ppm VCM cause 71 and 87% reductions in the rate of metabolism. Ethanol causes 96 and 83% reductions in the rate of VCM metabolism by rats exposed to 56 and 97 ppm VCM, respectively. The nonprotein sulfhydryl content of the liver (glutathione and cysteine) of rats exposed to VCM concentrations ranging from 50 to 15,000 ppm VCM is reduced without a relationship to dose. The primary metabolites of VCM react with the non-protein sulfhydryl. The final metabolic products excreted are S-(2-hydroxyethyl)cysteine and S-(2-carboxymethyl)cysteine and the respective N-acetyl derivatives. It is hypothesized that VCM is readily and extensively metabolized. Metabolism via the primary pathway, postulated to involve alcohol dehydrogenase, is swamped by exposures to concentrations exceeding 220 ppm. In rats exposed to concentrations at and exceeding this level, metabolism occurs via a secondary pathway, postulated to be epoxidation and/or peroxidation.

61508 **APTIC NO. 76604**

Horn, K. and W. H. Doerre

IMPAIRMENT OF HEALTH BY DUSTLIKE IMMISSIONS. *(Die Beeintraechtigung der Gesundheit durch staubfoermige Immissionen). Text in German. Z. ges. Hyg. Ihre Grenzgebiete (Berlin), 21(10):726-732, 1975.*

The important characteristics of respirable dust pollutants are reviewed, with emphasis on morbidity and mortality rates due to acute exposure and to chronic low level exposure, the impairment of function and performance, symptoms that affect the sense organs, threshold values, and other effects on the well-being and health of people. (Author abstract)

61509 **APTIC NO. 80027**

Hyodo, K., S. Suzuki, and N. Kishino

ON THE EFFECTS OF MINUTE AMOUNTS OF LEAD IN AIR. PART IV. *(Taikichu biryo namari no eikyo ni tsuite. Part 4). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 22(10):391, Oct. 1975.*

The effects of lead in air on human health were investigated by biochemical examination of the inhabitants of a city of 160,000 on a main road north of Tokyo, where there is a traffic load of 759 vehicles/hr. Lead in blood (11.2 plus or minus 4.7 microgram/100 g), lead in urine (19.7 plus or minus 11.7 microgram/l), delta-ALA dehydrase, delta-ALA in urine, and CP in urine were in the normal range. The average content of lead in air was 1.55 plus or minus 0.60 microgram/cu m. It was concluded that 1-2 microgram of lead/cu m of air does not affect the health of inhabitants in the community.

61510 **APTIC NO. 83539**

Ichikawa, I. and E. Yokoyama

METABOLISM OF PHOSPHOLIPID IN THE LUNG OF RATS EXPOSED TO OZONE. *(Ozone bakuro rat hai ni okeru rin-shishitsu-taisha). Text in Japanese. Preprint, Japan Pharmaceutical Assoc., Tokyo, p. 100-102, 1975. (Presented at the Environment-Polluting Substances and their Toxicology Symposium, 2nd, Gifu, Japan, Oct. 27-28, 1975.)*

Wistar SPF rats were exposed in groups to ozone at 1 - 2.5 ppm for 3 hr or 6 hr, or for 6 hr/day, 6 days/week for 6-7 weeks at 0.45 ppm. The results of short term exposure were: (1) the total phospholipids in the lung decreased due to a decrease of lecithin, (2) the amount of intake of labelled precursors into the phospholipids (especially lecithin) in lung tissue showed a significant decrease after exposure to ozone at 1 ppm for 3 hr and more only in the case of P32 and (3) in the microsomal fraction prepared from rat lungs after exposure to ozone at 2 ppm for 3 hr, acylation of linoleic acid significantly decreased, while acylation of palmitic acid increased conspicuously. Experimental results on Marinett enzyme activity in supernatant of the rat lung on the activity of phospholipase A are described. After long-term exposure to lower concentrations of ozone, the weight ratio of the lung to the whole body showed a small significant increase, although no significant difference of the composition of lung phospholipid and activities of phospholipase A and acyltransferase was observed.

61511 **APTIC NO. 84653**

Ichikawa, I.

EFFECT OF OZONE EXPOSURE ON THE METABOLISM OF PHOSPHOLIPIDS IN THE LUNG. *(Hai-rinshishitsu taisha ni taisuru ozone bakuro no eikyo). Text in Japanese. Proc. Res. Conversation Natl. Inst. Pub. Health, no. 56:3-4, 1975.*

Wistar rats were exposed in a chamber to ozone at various concentrations. Their lungs were removed, sliced to 0.2 g pieces with a 0.5 mm thickness, and incubated in Krebs-Ringer II liquid containing 14C-palmitic acid, 14C-linolic acid, and 32P-and 3H-glycerol at 37 C for 2 hr. In separate experiments, the lungs were homogenated and fractioned into mitchondrial, lysozomal, microsomal, and supernatant fractions. The activity of enzymes in the fractions was determined using radiolabelled substances. The total content of phospholipids in the lung tissue was reduced by exposure to ozone at concentrations above 2.5 ppm for 3 hr, suggesting the reduction of lechitine in pulmonary phospholipid. The intake of 32P-and 3H-glycerol into pulmonary phospholipid, especially lechitine, was reduced by exposure to ozone at 1 ppm for 3 hr, and that of 14C-palmitic acid also showed a reduction at more than 2.5 ppm, while that of 14C-linolic acid was not affected. The effect of ozone on enzymes in each fraction appeared at first as the promotion of the synthesis of pulmonal lechitine, then to degrade phospholipids, resulting in unfavorable results on pulmonary cells and tissue.

61512 **APTIC NO. 83175**

Ikawa. Mieko and Yoriko Mabuchi

FATE OF VANADIUM IN RAT ORGANS (I). ANALYSIS OF VANADIUM AND ITS DISTRIBUTION IN RAT ORGANS. *(Vanadium no seitainai unmei, (I). Seitaishiryo no vanadium bunsekiho to bunpu). Text in Japanese. Tokyo-to Eisei Kenkyusho Nenpo (Annu. Rept., Tokyo Met. Res. Inst. Environ, Prot.), 26(2):90-95, 1975. 14 refs.*

There have been local occurrences of as high as 0.296 microgram/cu m of vanadium in the air of Tokyo in the form of vanadium pentoxide. Vanadium is a factor in Yokohama asthma. The results of intraperitoneal administration of sodium metavanadate to Wistar rats at doses of 2 mg vanadium/kg and 4 mg/kg once a day for 7 days are reported. Determination of vanadium in several organs of the rats was carried out by a vanadium-cupferron chelate-MIBK extraction method at a pH of 2.5. An accumulation of vanadium was found in the bones, kidneys, liver, spleen and muscles. The high vanadium content in the pancreas was due to physical adherence by intraperitoneal administration. The contents of vanadium in the liver fractions were in increasing order of supernatant (95,500 g, 1.5 hr) less than nucleous (1000 g, 10 min) less than mitchondria (10,000 g, 30 min) less than microsomes.

61513 **APTIC NO. 79795**

Ikeda, M., T. Ishida, and M. Ogata

ON THE ACTIONS OF ACROLEIN ON AMINOACIDS AND PROTEIN. *(Acrolein no aminosan oyobi tampakushitsu ni taisuru sayo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):513, Nov. 1975.*

The actions of aldehydes, including acrolein, considered to be a cause of eye-irritation and ocular impairment due to photochemical smog were studied. After the reaction of acrolein with glycine and cystein, the NS2 radical of glycine disappeared and cystein was changed to another substance. After the reaction of lysozyme and acrolein, lysine disappeared in the reactant. In the reaction of acrolein, formaldehyde, and acetaldehyde with a reduced type of glutathione, only acrolein inhibited the reducing activity of glutathione. In the reaction of acrolein, formaldehyde, and acetaldehyde with papain, only acrolein inhibited the activity of papain. Study of immunological properties of aldehyde-modified protein of bovine serum albumin in rabbits showed the difference of antigenicity between acrolein- modified and formaldehyde-modified albumin. Acrolein caused potassium ion release from rat liver mitochondria; formaldehyde and acetaldehyde did not cause the release. These findings suggested the importance of acrolein in causing impairment of eyes and cornea.

61514 **APTIC NO. 79979**

Imai, Masayuki, Hidehiko Oshima, Katsumi Yoshida, and Masayuki Kitabatake

ON THE EFFECTS OF AIR POLLUTION ON HUMAN BODY PART V. ON THE MORBIDITY OF RESPIRATORY DISEASES. *(Taikiosen no jintai ni oyobosu eikyo ni tsuite V. Kokyukikei yushoritsu ni tsuite). Text in Japanese. Mie Igaku (J. Med. Mie Prefect. Univ.), 19(1):19-23, 1975. 6 refs.*

The morbidity of respiratory diseases of inhabitants between ages 40 and 60 living within 3 km of an air pollution monitoring point neighboring the petrochemical complex in Yokkaichi City was investigated by inquiries based on the BMRC. The subjects were 570 men and 645 women. The data were compared to inhabitants of non-polluted Akita City. The morbidity of every respiratory disease, such as bronchitis, pneumonia, lung tuberculosis, bronchial asthma, and pulmonary emphysema, showed an increasing tendency in polluted areas, and the local difference of morbidity became larger as the symptoms such as cough and sputum became heavier.

61515 **APTIC NO. 82191**

Imai, Masayuki, Masayoshi Kitabatake, Katsumi Yoshida, and Hidehiko Oshima

AIR POLLUTION EFFECTS ON THE HUMAN BODY - INDEX IN THE EPIDEMIOLOGICAL STUDIES. *(Taikiosen no jintai ni oyobosu eikyo ni tsuite ekigaku ni okeru jintaishihyo ni tsuite). Text in Japanese. Mie Igaku (J. Med. Mie Prefect Univ.), 19(2):123-125, 1975. 7 refs.*

The selection of an index for epidemiological studies on the effects of air pollution on humans is discussed, based on a study in Yokkaichi. It was concluded that in addition to the frequency of medical consultation and the morbidity of chronic bronchitis in older persons, factors used previously as an index of the effects of air pollution, the frequency of medical consultation and the morbidity of bronchial asthma in the younger generation will be used when the state of air pollution improves.

61516 **APTIC NO. 82233**

Imai, M., K. Yoshida, M. Kitabayashi, and H. Oshima

ON THE EFFECT OF AIR POLLUTION TO HUMAN BODIES (ON THE HUMAN BODY INDICATOR IN EPIDEMIOLOGY). *(Taikiosen no jintai ni oyobosu eikyo ni tsuite: ekigaku ni okeru jintai shihyo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):499, Nov. 1975.*

In order to enlarge or reduce the area officially designated to be environmentally polluted, the status of the area should be surveyed epidemiologically. The frequency of consulting doctors on bronchial asthma (by schoolchildren) and on chronic bronchitis (by aged people) were excellent indicators. However, due to the fact that these disorders are frequently difficult to examine during the interval stage between paroxysms, it is necessary to rely upon retrospective surveys.

61517 **APTIC NO. 80167**

Ishikawa, Satoshi and Shinichi Shikano

DEVELOPMENT OF MYOPIA DUE TO CHRONIC ORGANOPHOSPHATE COMPOUNDS. EXPERIMENTAL AND CLINICAL STUDIES. *Preprint, International Congress of Scientists on the Human Environment, p. 64, 1975. (Presented at the International Congress of Scientists on the Human Environment, Kyoto, Japan, Nov. 17-26, 1975.)*

Onset of cases of myopia, astigmatism, autonomic nervous disturbances, optic neuritis, retinal pigmentary degeneration, and general neurological symptoms paralleled the helicopter spraying of organophosphate pesticides in the Saku area. An experiment is reviewed in which dogs developed myopia 1 year after the start of daily oral administration of 0.5 to 1.5 mg of ethylthiometon. A similar experiment was performed giving each dog 0.5 to 1.5 mg of orthomethyl-parathion once a week for 1 year. The development of myopia was similar to that with ethyl-thiometon. The optic nerve and pigment epithelium as well as the sural nerve were involved.

61518 **APTIC NO. 79580**

Ishinishi, S., Y. Kodama, and K. Nobutomo

EXPERIMENTAL STUDIES ON THE CARCINOGENITY OF DUSTS CONTAINING ARSENIC. *(Hiso-funjin no hatsugansei ni kansuru hikkenteki kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 10(4):517, Nov. 1975.*

Arsenic ore and copper refinery smoke dust, containing 3.95% and 10.6% arsenic, respectively, and anhydrous arsenious oxide, benz(a)pyrene, arsenic ore plus benz(a)pyrene, smoke dust plus benz(a)pyrene, and anhyd-arsenious oxide plus benz(a)pyrene were injected into the lungs of adult male Wistar King rats once a week for 15 weeks at 0.2 mg As2O3/wk. Rats were observed for their life-span. No malignant tumor developed in the groups administered the ore and As2O3. In one of 7 rats administered the dust, adenocarcinoma developed, with precancerous findings on the 6 remaining rats, including adenoma and metaplasia of the squamous epithelium and bones; however, these findings were not regarded as proof of the carcinogenicity of these substances. On the other hand, in the group simultaneously administered smoke dust and benz(a)pyrene, the onset of lung cancer was 2 times that of the group administered only benz(a)pyrene, suggesting synergistic action.

61519 **APTIC NO. 79579**

Iwamura, K., O. Fukase, and H. Watanabe

EFFECTS OF OZONE ON ALVEOLAR MACROPHAGES. *(Ozon no hai macrophage e no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 10(4):474, Nov. 1975.*

Male rabbits were exposed in 3 groups to ozone at 1 ppm for 3 hours, at 2-3 ppm for 3 hours, and at 1 ppm 3 hr/day for 3 days. After breathing purified air for a day their lungs were removed, and alveolar macrophages were collected aseptically. After culturing and staining, the number of the macrophages was counted. The number of alveolar macrophages decreased during the first day even in the group not exposed; however, after culturing for 9 days it was smallest in the group exposed to 2-3 ppm, followed by the group given sustained exposure, then by the group exposed to 1 ppm for 3 hours. The mitotic index showed the same tendency. Ozone caused damage to the viability of macrophages, resulting in reduced ability to adhere to the glass wall of the culture vessel, and in reduced mitotic activity.

61520 **APTIC NO. 84611**

Izumi, Takashi, Shunsuke Mori, Kazuhiko Hirayoshi, and Ryu Aizawa

PRESENT STATUS OF OFFENSIVE ODOR POLLUTION BY ANIMAL PROCESSING PLANTS. NO. 1. EFFECTS ON SCHOOLCHILDREN S STUDYING. *(Bojukotsu kagaku kojo ni yoru akushu kogai no jittai. 1. Sho,chugakusei no gakushu ni oyobosu eikyo). Text in Japanese. Preprint, Japan Society of Public Health, Tokyo, p. 421, 1975. (Presented at the Japanese Society of Public Health Annual Meeting, 34th, Yokohama, Oct. 1975, Paper 635.)*

The odor from a meat processing factory in Isahaya City, Japan, was examined to determine its effect on the studying habits of schoolchildren living near the factory. A questionnaire was distributed to 243 elementary school students and 225 high school students. The questionnaire required affirmative or negative responses to 17 different questions. Fifty to 60% of the elementary schoolchildren complained that the factory odor affected their studying, while 80% of the high schoolchildren were negatively affected by the odor. Seventy-seven percent of the elementary school students answered that they had to close the windows when they studied. Almost 100% of the high school students said that they had to close the windows when they studied. The effects of the odor on the health of the children included high incidences of vomiting and loss of appetite. No difference in health effects by sex was observed. The methyl mercaptan concentration at the boundaries of the factory was greater than 0.022 ppm.

61521 **APTIC NO. 82227**

Kagawa, J., T. Toyama, and M. Nakaza

EFFECTS OF SEVERAL ENVIRONMENTAL FACTORS ON THE LUNG FUNCTION OF PRIMARY SCHOOLCHILDREN. *(Kakushu kankyo inshi no Shogakusei no haikino ni oyobosu eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):504, Nov. 1975.*

Changes of lung function due to the variation of air pollutants (8 kinds) and meteorological conditions (6 conditions) were studied in 10 boys and girls in a primary school in Tokyo. Tests were made once or twice per week from June 1972 to Dec. 1973. The factor which showed the most significant correlation with lung function was temperature, followed by the concentration of nitrogen dioxide, ozone, nitrogen monoxide, nitrogen oxides, SPM and sulfur dioxide in that order. A positive correlation between temperature and Vmax, and a negative one between ozone and Gaw/Vtg were found in both warm and cool seasons. A negative correlation between nitrogen dioxide or nitrogen oxides and Gaw/Vtg, and a negative correlation between SPM and Gar/Vtg were observed only in the warm season. The correlation coefficient indicates that an increase of ozone results in upper airway stenosis, an increase in nitrogen dioxide and oxides results in a tendency for lower airway stenosis, and an increase in nitrogen oxides and nitrogen dioxide results in upper airway stenosis during the warm season. The effects of air pollutants or lung function are apparently heightened by warm seasonal temperatures.

61522 **APTIC NO. 76380**

Kalpazanov, J., G. Kurtschatova, and M. Stamenova

AIR POLLUTION AND INFLUENZA EPIDEMIC IN SOFIA. *(Luftverunreinigung und Grippeepidemie in Sofia). Text in German. Z. ges. Hyg. Ihre Grenzgebiete (Berlin), 21(9):683-685, 1975. 8 refs.*

The dependence of morbidity on air pollution with respect to the influenza epidemic in Sofia was studied. The following correlations were established: with concentration of dust, 0.656; with nitric oxide, 0.652; with oxidants, 0.865; with formaldehyde, 0.600; with sulfur dioxide, 0.596; (P less than 0.015).

61523 **APTIC NO. 80058**

Kamayama, H.

OCULAR DISTURBANCES BY AIR POLLUTION. *(Taikiosen ni yoru ganshogai). Text in Japanese. Iyaku no Mon (Gateway Med.), 15(7):171-173, June 1975.*

Ocular disturbances can be divided into 2 categories: those due to light scattering and absorbing by polluted air, and those more serious ocular diseases caused by the action of chemical air pollutants on the eyes. Air pollutants such as sulfur dioxide, nitrogen oxides, carbon monoxide, hydrocarbons, hydrogen sulfide, aldehydes, and chlorine may preferentially attack the respiratory system; there would be few cases in which they are the cause of ocular diseases. Oxidants, including sulfuric mist, formaldehyde, acrolein, and peroxyacetyl nitrate do irritate the ocular system. In cases of severe pollution, or of repeated exposure, redness of the conjunctiva was observed which was due to the dilatation of vessels in the conjunctivae of the eyelid and eyeball, characterized by light ciliary injection without accompanying edema and opacity in the conjunctiva. The objective symptoms are the same as that of chemical inflammation of the cornea and conjunctiva, which is curable in 24 hours. It is necessary to wash the eyes with clean water and to prevent bacterial infection. The prognosis is generally good, in the author s experience.

61524 **APTIC NO. 83381**

Kamiyama, N., S. Meguro, and H. Hayashi

ON FIBROUS MATTER AND IRON-CONTAINING (FERRUGINOUS) BODIES IN THE LUNG TISSUE OF THE INHABITANTS IN TOKYO METROPOLIS AND ITS NEIGHBOURING PREFECTURES. *(Tokyo-to oyobi sono kinken jumin no haisoshikinai senijobusshitsu to gantetsu shotai ni tsuite). Text in Japanese. In: Annual Report of the Industrial Health Institute in 1974, p. 67-68, 1975.*

One hundred sliced specimens of the lungs of inhabitants without a dusty occupational history and with small amounts of dust sedimentation were calcined at a low temperature on glass slides to observe the number of inorganic fibrous materials and ferruginous bodies/sq cm, using a phase different microscope. Fibrous materials and ferruginous bodies were found in 88% of the specimens, and ferruginous bodies were found in 78% of the specimens. After treating the same specimens with a carbon extract, the identification of inorganic fibrous materials and the main material of ferruginous bodies was carried out by electron micrography and electron diffraction. The results show that the fibrous materials are 5 micron in length and that the fibrous materials and the main material of ferruginous bodies consisted mainly of asbestos and asbestos bodies composed mainly of crysotile. This finding showed that the same phenomenon of asbestos pollution exists in the inhabitants in Tokyo and its surroundings as in the large cities of Europe and the U. S.

61525 **APTIC NO. 82263**

Kamiyama, S.

RELATION BETWEEN RESPIRATORY SYMPTOMS OF MIDDLE SCHOOLCHILDREN AND THEIR LUNG FUNCTION. *(Chugaku seito no kokyukishojo to hai kino tono kanren). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 22(10):413, Oct. 1975. 1 ref.*

In Akita City, sulfur dioxide concentration in 1974 was 0.018, 0.014, 0.012, and 0.010 ppm respectively in A, B, C, and D areas. The complaints of middle schoolchildren about respiratory symptoms showed difference in duration of suffering from cold and bronchitis only between those living in A and B areas, and those living in C and D areas. Complaints were more frequent in the former. Physical states of children in C and D areas (mainly residential areas) were superior to those in A and B areas, in terms of vital capacity, one second rate, and PF value. However, no significant difference of V25/V50, V/V25, and V5/V10 was found between children in A and B areas and those in C and D areas. Concentration of sulfur dioxide in A and B areas has been reduced noticeably from 1970 (0.044 ppm and 0.025 ppm) to 1974 (0.018 ppm and 0.014 ppm).

61526 **APTIC NO. 72664**

Katagiri, Y. and M. Kawai

STUDIES ON THE EXPOSURE OF INFANTS TO LEAD: EXCRETION OF LEAD IN THE URINE OF 3-YEAR OLD INFANTS. *(Shoni no namari bakuro ni kansuru kenkyu: 3 sai ji no nyochu namari haiseturyo). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 30(1):106, April 1975.*

The lead content in the urine of about 250 3-year old infants in Gifu City was determined. The distribution of lead in urine was log normal with an average of 14.2 + or - 12.4 and a median of 10.2 microgram/l. There was a difference between sexes. Groups having positive and negative coproporphyrin did not show different urinary lead levels. Urinary lead was not different in inhabitants of the city and suburbs. There was no direct relationship between lead in air and lead in infantile urine; however, according to the finding that there were 20 cases out of 247 cases which showed a higher lead concentration than 30 microgram/l, the possibility of excessive absorption of lead by infants was admitted.

61527 **APTIC NO. 84529**

Katayama, A. and N. Kawaguchi

RESULTS OF SURVEY ON CARRIERS OF PHARYNGEAL HEMOLYTIC STREPTOCOCCI IN SCHOOLCHILDREN, ESPECIALLY IN THE RELATIONSHIP TO AIR POLLUTION. *(Gakudo into yorenkin hokin chosa, tokuni taikiosen tono kanrenni tsuite). Text in Japanese. Yamaguchi-Ken Eisei Kenkyusho Nenpo (Ann. Rept. Yamaguchi Prefect. Inst. Health), no. 17:28-29, 1975.*

In December 1974, after a similar study in 1973, the percentage of carriers of pharyngeal hemolytic streptococci was surveyed among 30 primary schoolchildren in an air polluted area of Shinnanyo city and 31 children in a non-polluted area of Toyoda. From both groups, 3.3% had A-Group-12 type and 3.2% had G-group. Gram s staining method revealed that gram-positive micrococci were most numerous in children of both areas, followed by Gram- positive bacilli, Gram-negative micrococci were more numerous in non-polluted areas; however, no relationship could be found to air pollution. The most frequently found species were Staphylococcus, alphahemolytic Streptococcus, and Neisseria, in children of both areas.

61528 **APTIC NO. 79945**

Kato, M. and Y. Ishibe

ADULT RESPIRATORY DISTRESS SYNDROME BY INHALATION OF POISONOUS GASES. *(Yugaigasu kyu-*

nyu ni yoru ARDS). Text in Japanese. Kurinika (Clinica), 2(8):662-667, Aug. 1975. 11 refs.

The common characteristics of adult respiratory distress due to exposure to poisonous gases are described. Symptoms are: (1) the appearance of transient hydrops and spasm of the glottis with accentuation of secretion in the airway, beginning just after exposure. (2) A definite latent period between exposure and the onset of chemical pneumonia or of pulmonary edema, ranging from a few hours to several months. (3) Obstructive bronchiolitis occurring as a sequela. Tolerance to the poisonous gas increases after exposure to the gas by inhalation at low concentrations. The clinical characteristics due to nitrogen oxides, ozone, phosgene, and chlorine are described in detail.

61529 **APTIC NO. 83380**

Kawai, K., S. Shimizu, and K. Fujii

STUDIES OF THE PATHOGENICITY OF COMBUSTION PRODUCTS OF HEAVY OIL PART 10. EXAMINATION OF CARCINOGENICITY OF SOOT. *(Juyu nensho seiseibutsu no byogensei ni kansuru kenkyu (X) Susu no gangensei no kento). Text in Japanese. In: Annual Report of the Industrial Health Institute 1974, p. 32-33, 1975.*

Four groups of new born ICJ-JCR mice, each group consisting of 30-42 mixed sexes, were treated respectively, with soot (deposited in ducts during combustion) 4 times/wk (total dose amounting to 45 mg/kg body weight), soot 2 times/wk (total dose of 9 mg/kg b.w.), benz(a)pyrene (40 microgram/kg b.w.), and a 1% gelatin of 0.03 mg/kg b.w. The soot contained 264 ng/g of benz(a)pyrene, and heavy metals such as vanadium, nickel and chromium, and was given as a suspension in physiological saline. The treatment was begun within 24 hr of birth. The results after 15 months of the first injection were: 12 males and 10 females of the first group died with 14 mice showing tumors; 6 males and 4 females of the second group died with 6 mice showing tumors; 4 males and 8 females of the third group died and 6 mice showing tumors, and 8 males and 8 females of the fourth group died with one mouse with a tumor. A tendency for increased tumorigenesis with soot injection was clearly found. The tumor generated by soot was mainly lymphoma (18/20); there was one lung tumor and one liver tumor. The experiment is being continued. The carcinogenicity of benz(a)pyrene was fortified about 2000 times in the soot.

61530 **APTIC NO. 83717**

Kawasaki, M.

A CASE OF OCCUPATIONAL BRONCHIAL ASTHMA DUE TO CHICAGO ACID, A DYE STUFF INTERMEDIATE. *(Senryochukantai, Chicago Acid, ni yoru shokugyosei kikanshizensoku no ichirei). Text in Japanese. Min-I-Ren Iryo (J. All-Jap. Leagues Democr. Med. Inst.), no. 43:21-23, 1975.*

A case of bronchial asthma brought on by inhaling Chicago acid dust is described. The patient, a man of 36 with no family history of allergic diseases but with a history of urticaria at age 29 was engaged in handling Chicago acid, once for 2 months at age of 24 and again for a half-month at age 31. The second time, after handling the acid dust for several minutes he felt a strange sensation in the throat and experienced sneezes, stridor, and dyspnea. One year later, when he handled Direkt sky blue 6B, an asthmatic fit occurred. On this first occasion, he showed a slight obstructive disturbance without any abnormal medical results upon examination, and no reaction to commercial allergens. Skin tests with aqueous solutions of Chicago acid were conducted; the scratch test and intracutaneous test were positive. An inhalation test provoked an asthmatic fit. He was treated by a desensitizing method; however, when he handled S-acid, the asthmatic fit appeared. The relationship between these dye intermediates and acute bronchial asthma is discussed.

61531 **APTIC NO. 81505**

Kekki-Hellman, Annele

VINYL CHLORIDE: ITS POISONOUSNESS AND USE IN THE PLASTICS INDUSTRY. *(Vinyylikloridin myrkyllisyydesta ja kaytosta muoviteollisuudessa). Kemia-Kemi, 2(4):159-162, 1975. 9 refs. Translated from Finnish, 14p.*

The toxicity of vinyl chloride is discussed along with its widespread use in the plastics industry. The production of polyvinyl chloride from vinyl chloride monomer exceeded 750,000 tons in the United States during 1964, and its world production is expected to reach 15,100,000 tons/yr by 1980. Occupational exposures to a few thousand ppm of vinyl chloride result in irritation of the respiratory passages, balance disturbances, various degrees of sensory numbness, and other symptoms comparable to those of drunkeness. Animal tests and epidemiological studies also reveal cardiovascular disturbances as a result of vinyl chloride exposure. Blood platelet deficiencies are characteristic of persons exposed to vinyl chloride and complaining of circulatory disturbances. Vinyl chloride is also capable of causing cancer in mice at concentrations as low as 50 ppm. A cancer of the connective tissue of the liver has been observed among workers in the plastics industry exposed to vinyl chloride.

61532 **APTIC NO. 80308**

Kerr, H. D., T. J. Kulle, M. L. McIlhany, and P. Swidersky

EFFECTS OF OZONE ON PULMONARY FUNCTION IN NORMAL SUBJECTS. AN ENVIRONMENTAL-CHAMBER STUDY. *Am. Rev. Respirat. Disease, 111(6):763-774, 1975. 15 refs.*

Twenty healthy adults, 10 smokers and 10 non-smokers, were exposed to 0.5 ppm of ozone for 6 hr in an environmental chamber. They engaged in two 15 min medium exercise stints on a bicycle ergometer during this period. The symptoms most commonly noted with exposure to ozone, dry cough and chest discomfort, were experienced by more non-smokers than smokers. Subjects who experienced symptoms, in general, were those who developed objective evidence of decreased pulmonary function. Significant changes from control values for the group as a whole with exposure to ozone were observed for the following pulmonary function tests: specific airway conductance, pulmonary resistance, forced vital capacity, and 3 sec forced expiratory volume. No significant change was observed with respect to diffusing capacity for carbon monoxide, static compliance, or the various tests derived from the nitrogen elimination rate. Non-smokers exhibited a significant decrease in dynamic compliance after exposure to ozone. When the smokers were considered as a separate group, no significant decrease in pulmonary function was observed, although some individual smokers showed adverse functional changes. (Author abstract)

61533 **APTIC NO. 82351**

Kimura, I.

SURVEY OF POLLENS IN AIR AND STUDY OF POLLEN-ASTHMA IN OKAYAMA AREA. *(Okayama chiho no kuchu kafunchosa narabini kafun-zensoku ni kansuru kenkyu). Text in Japanese. Okayama Igakkai Zasshi (J. Okayama Md. Soc.), 87(9-10):937-940, 1975. 7 refs.*

A survey of pollen in air in Okayama in 1972 is described. The number of pollen grains sampled showed 2 large peaks on March 21 (26/sq cm/24 hr, mainly cryptomeria), and April 27 (37/sq cm/24 hr, mainly pinus). Graminae and Ambrosia artemisifalia pollen grains were fewer, in that order. Skin tests at an allergy clinic showed a positivity to A. a. of 29%, relatively high in spite of the scarcity of its pollen in the area, while the positivity to Cryptomeria japonica was only 7%, very low in spite of the prevalence of its pollen. One case of A. a.-asthma in a 42-year-old woman, and one case of C.j-asthma in a 37-year-old woman are described. The antigenic activity of pollen of C.j was low, and the antigenic activity of pollen of A.a. was

high enough to frequently result in asthma. The difference between pollenosis and pollen asthma is discussed.

61534 **APTIC NO. 82230**

Kitabatake, M., K. Yoshida, and M. Imai

ON THE DECREASE OF SULFUR OXIDES AND TIME CHANGE OF RESPIRATORY DISEASES IN YOKKAICHI AREA. *(Yokkaichi chiiki ni okeru io-sankabutsu no teigen to kokyuki shikkan no suii ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):495, Nov. 1975.*

Because of the regulation of total emission of sulfur oxides since 1972 in the Yokkaichi area, the environmental concentration decreased to a little over the environmental standard. The trends of respiratory deseases in this area were compared to those in Tsu City. The findings were: (1) the relationship between the acute respiratory diseases and air pollutants such as sulfur oxides and nitrogen oxides (there had been significant relationship) became insignificant (r : 0.3), and (2) the prevalency of chronic or obstructive diseases increased at the threshold values of the air pollutants at 1 mg/day, not only in Yokkaichi but also in Tsu City. It was confirmed that (1) the morbidity of acute respiratory diseases such as cold decreased with the decrease of air pollution, and (2) in younger people, morbidity of asthma-type diseases decreased, showing the effect of decrease of air pollution. However, in aged persons the decrease is not notificeable; these people showed the onset of disease in the past when air pollution was more severe. These tendencies with age were the same in chronic, or obstructive diseases.

61535 **APTIC NO. 83878**

Kitabatake, Masayoshi

THE EFFECTS OF AIR POLLUTANTS ON PROVOKING EXPERIMENTAL ASTHMA IN GUINEA PIGS. PART 2. EFFECTS OF SULFUR DIOXIDE, NITROGEN DIOXIDE, AND OZONE. *(Morumotto no jikken zensoku jakki ni oyobosu taikiosen bushhitsu no eikyo ni tsuite. Part 2. Aryusan gas, nisanka chisso oyobi ozone no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(5):712-717, 1976. 28 refs.*

A body-plethyamograph was used to confirm that simultaneous exposure to sulfur dioxide (5.6 ppm), nitrogen dioxide (5.6 ppm), or ozone (4.9 ppm) with sensitization via the airway resulted in an increase of asthma. It was also indicated that exposure to sulfur dioxide or nitrogen dioxide could make the air way hypersensitive.

61536 **APTIC NO. 82774**

Knelson, John H. and Robert E. Lee, Jr.

PROJECTED HEALTH IMPLICATIONS OF MAJOR AUTOMOTIVE EMISSIONS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., 13p., 1975. 6 refs. (Presented at the Joint U. S./USSR Symposium on the Comprehensive Analysis of the Environment, Honolulu, Hawaii, Oct. 24-25, 1975.)*

Damage functions which relate per year health consequences to incremental levels of air pollutant exposure using a total population basis are computed for major automobile emissions. Using San Francisco as an example, a vehicle emissions standard of 25 g of carbon monoxide/mi results in 100,000 person-hours being lost due to excess disability in 1980 and 1,250,000 person-hours in the year 2000. In contrast, a vehicle emission standard of 9 g/mi for CO results in 100,000 person-hours being lost in 1980 but only 10,500 person-hours in 2000, a decrease of 99% over the 25 g/mi emission standard. Similar damage functions are calculated for photochemical oxidants and nitrogen dioxide in other areas of the country.

61537 **APTIC NO. 83719**

Kobayashi, Hiroyoshi, Nobuyoki Kamiya, Seiji Yoshida, and Kogo Hiraga

ACUTE TOXICITY OF SODIUM METAVANADATE. *(Metavanadin-san natrium no kyuscidokusei). Text in Japanese. Tokyo to Eisei Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Lab Public Health), 26(2):83-89, 1975. 6 refs.*

The rapid increase of floating particulate vanadium in the air of Tokyo is described. Experimental results on the oral toxicity of sodium metavanadate to rats and mice are given. Groups of 7-week-old SLC-Wistar rats and JLC-Wistar rats, and 38-week-old JCL-SD rats were administered by metavanadate by stomach tube at 5 dosages between 50-275 mg/kg. Groups of JCL-ICR mice 8.9 and 43 weeks old were administered metavanadate at dosages of 198-997 mg/kg. From the morbidity during 14 days, the LD50 values were calculated as 125.6 and 95.9 mg/kg for JLC-Wistar rats (male and female); 124.9 mg/kg for male and female SLC-Wistar rat; 65.8 mg/kg for male and female JCL-SD rats; and 294.7-259 and 309.9-279.9 mg/kg for male and female mice 8-9 weeks old. The LD5O values for 43-week-old mice were between the above values. Toxic symptoms observed on the mouse and rat included effects on the circulatory system, the digestive system, the liver and kidney, hypertrophy and hyperemia of the adrenal, cerebral hyperemia, and hypertrophy of the gall bladder in mice.

61538 **APTIC NO. 82231**

Kodama, Y., S. Ishinishi, and E. Kunitake

EPIDEMIOLOGICAL STUDIES ON THE MORTALITY DUE TO THE LUNG CANCER IN INHABITANTS IN KITAKYUSHU CITY (YAWATA WARD) AND FUKUOKA CITY: COMPARISON OF MORTALITY WITH LENGTH OF RESIDENCE. *(Kitakyushu-shi (Yawata-ku) oyobi Fukuoka-shi jumin no haigan shiboritsu ni kansuru ekigakuteki kenkyu: Kyoju reki ni yoru hikaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):497, Nov. 1975.*

The contribution of air pollution to the mortality due to lung cancer was investigated with an epidemiological analysis of deaths due to lung cancer in Kitakyushu and Fukuoka Cities. Length of residence (over 20, 20-10 and less than 10 years) in air polluted or in non air polluted areas, smoking history, and occupational history of harmful or non-harmful duties were considered. The results of the analysis were: (1) the effect of smoking on the mortality due to the lung cancer was confirmed for both sexes, (2) the effect of occupational history on mortality was confirmed only for males and (3) the length of residence in polluted areas was not found to affect the mortality due to the lung cancer.

61539 **APTIC NO. 82863**

Komatsu, G., M. Shishido, T. Sugita, F. Higuchi, and S. Ogihara

EPIDEMIOLOGICAL STUDIES ON CHEST DISEASES, PART 5. RESULTS OF MASS MEDICAL INSPECTION OF INHABITANTS OF AN AUTO EXHAUST-POLLUTED AREA BY FLOW-VOLUME CURVES. *(Kyobu shikkan no ekigakuteki kenkyu Part 5. Jidosha-haikigas osen chiku jumin no FV-kyokusen nado ni yoru shudan kenshin seiseki). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), 13(4):237-238, 1975.*

Of 46 inhabitants studied in an auto exhaust-polluted area, 6 inhabitants had a 1-sec rate of over 80%, and 3 inhabitants had a vital capacity of less than 80%. However, no-one manifested a peripheral airway impairment on flow-volume curves. Of 53 inhabitants in another auto exhaust-polluted area with a 1-hr average concentration of 0.186 ppm of nitrogen oxides and of 9.4 ppm of carbon monoxide, 7 inhabitants had a 1-sec rate of less than 80% as well as peripheral airway impairment; 5 in-

habitants showed only 1 second rate less than 80%. Three inhabitants had a vital capacity of less than 80% and peripheral airway impairment, and 5 inhabitants had a vital capacity of less than 80%. In all 15 inhabitants with lung function impairment were detected, and of them 8 inhabitants had a tobacco coefficient of more than 200.

61540 **APTIC NO. 81504**

Komitowski, D.

EXPERIMENTAL BERYLLIUM-INDUCED BONE SARCOMAS. *(Experimentell durch Beryllium induzierte Knochensarkome). Preprint, 1975 (?). Translated from German, 6p.*

A method for the induction of bone tumors by the local application of beryllium is described which prevents the further transport of beryllium to other tissues and organs. Beryllium oxide particles (4 micron in diameter) are coupled to gelatin and placed in the bone marrow cavity. Gelatin resorption is paralleled by a bone marrow fibrosis in which the beryllium crystals become enclosed by a capsule of connective tissue, thus fixing them in the marrow cavity. Diagnoses of bone tumors in five rabbits so treated showed osteogenic sarcoma in all cases. The tumor cells exhibited high alkaline phosphatase and succinate dehydrogenase activities. Acid phosphatase activity was detected not only in giant cells but also in atypical osteoplasts. Bone tumors generated by local intraossal application differed from those generated intraveneously by the following features: greater diversity of tumor tissues, greater percentage of giant cells, marked necrotic changes, and appreciable acid phosphatase activity in the atypical osteoplasts. Electron microscopy identified three types of tumor cells: those characterized by a proliferating rough endoplasmic reticulum, those containing a fibrillary structure in the cytoplasm with a less well-developed rough endoplasmic reticulum, and cell types intermediate between the above two types.

61541 **APTIC NO. 83859**

Kono, Koichi

TOXICITY OF PRODUCTS OF FLUOROCARBON ELASTOMER PYROLYSIS. *(Fussogomu no netsubunkai dokusei ni tsuite). Text in Japanese. Sangyo Igaku (Jap. J. Ind. Health), 17:288-301, 1975. 35 refs.*

Male mice (dd-strain) with body weights of 18-22 g were exposed for one hour to a gas evolved by pyrolyzing a fluorocarbon elastomer consisting of vinylidene fluoride and hexafluoropropylene and containing no sulfur at 55 C for 20 min in an air stream. The lethal amount of the leactomer which was pyrolyzed proved to be 1.05 g/cu m. The major lethal toxicant was found to be hydrogen fluoride. The components of pyrolysis gas other than HF were tetrafluoroethylene, vinylidene fluoride, hexafluoropropylene, and higher boilers; however, octafluoroisobutylene could not be detected under all conditions of pyrolysis studied. The symptoms of mice during exposure were: twinkling, jumping motion, tearing, and ataxic movement, found in proportion to the concentration of the gas. The pathohistological findings on the dead mice are described in detail.

61542 **APTIC NO. 82533**

Kotake, Y.

INVESTIGATION OF ATROPHY OF SUBCUTANEOUS TISSUE BY DESENSITIZING TREATMENT ON INFANTILE PATIENTS OF BRONCHIAL ASTHMA, CHRONIC BRONCHITIS ALLERGIC BRONCHITIS AND ASTHMATIC BRONCHITIS. *(Shoni no genkansaryoho ni yoru hikasoshiki no ishuku ni kansuru chosa). Text in Japanese. Min-I-Ren Iryo (J. All-Jap. Leagues Democr. Med. Inst.), no. 43:27-28, 1975.*

Sixty patients with bronchial asthma, chronic bronchitis, allergic bronchitis, and asthmatic bronchitis received desensitizing injections. A retraction at the point of injection occurred in 23; fall-out of pigment at the point of injection in 28; induration at the point of injection injection in 8; and swelling in 1. All patients were under age 15. The kind injection was not significantly related to abnormal reactions, but the frequency of injection was. The abnormalities after injection disappeared after 2 months. When the mode of injection was changed from subcutaneous to intracutaneous, no such abnormalities appeared in the injected parts.

61543 **APTIC NO. 83546**

Kubota, H., M. Yoneda, and Y. Nukada

EVALUATION OF DIAGNOSES ON BRONCHITIS AND OTHER DISEASES, DUE TO AIR POLLUTION. *(Taikiosen ni kakawaru kikanshien sonota no shindan no hyoka). Text in Japanese. Koshu Eisei Joho (Public Health Inform.), 5(11):18, 1975.*

The diagnoses by physicians of respiratory diseases due to air pollution for inhabitants in Ota Ward were evaluated. Symptoms and the medical certificates attached to the application for official recognition of environmental pollution injury were statistically examined. The cases numbered 555 in 1972 and 858 in 1973. The frequency of respiratory diseases was larger for bronchial asthma in 1972 and for asthmatic bronchitis in 1973. The average age of the patients was 7.1 in 1972 and 7.2 in 1973 for bronchial asthma, and 4.0 in 1972 and 3.3 in 1973 for asthmatic bronchitis. Physicians diagnosed differently when facing the same disease, according to statistical examination. The frequency of diagnosis of asthma was larger in national hospitals and University hospitals than in other hospitals and medical centers. About 60% of patients younger than 3 were diagnosed as having bronchitis and about 70% of patients who had taken ill when older than 3 were diagnosed as having asthma. No difference was found in symptoms described in the certificates. It was presumed that the disease in babies older than 3 years was almost asthmatic bronchitis or palingenetic bronchitis, and that of those younger than 3 years was allergic bronchitis or a light type of bronchial asthma in the infantile stage.

61544 **APTIC NO. 83790**

Kudo, S.

THE MEDICAL TREATMENT OF OBSTRUCTIVE PULMONARY DISEASES IN INHABITANTS OF AIR POLLUTED AREAS. PART 1. RESULT OF DESENSITIZING TREATMENT OF BRONCHIAL ASTHMA. *(Taikiosen chitai no keisokusei haishikkan no chiryo. Part 1. Kikanshigensoku ni taisuru genkansaryoho no chiryoseiseki). Text in Japanese. Min-I-Ren Iryo (All-Japan Leagues Democr. Med. Inst.), no. 43:25-27, 1975.*

Outpatients of a hospital in the Keihin industrial zone were studied. Sixty% of those suffering from non-tubercular pulmonary diseases had obstructive ailments; about 40% had bronchial asthma. The results of desensitizing treatments on these patients using specified allergens are examined. The patients were 22 males and 28 females from age 3 to 65. The positivity of intracutaneous reaction was 40% for H. D., 42% for candida, and 20% for fungi, and relatively high on common ragweed and paspart. The frequency of the kind of allergens utilized ranged from H.D. (68%), followed by candida (44%) and fungi (25%); mixed allergens were utilized in cases of multisensitized patients. There were 23 severe cases, 18 moderate cases, and 9 light cases; after an average treatment of 20 months, these figures were 0, 5, and 36, respectively; 9 patients became attack-free. It was concluded that even in polluted areas when the allergen was specified the desensitization treatment has a certain effectiveness as a remedy for bronchial asthma.

61545 **APTIC NO. 76489**

Kuller, Lewis H., Edward P. Radford, David Swift, Joshua A. Perper, and Russell Fisher

CARBON MONOXIDE AND HEART ATTACKS. *Arch. Environ. Health, 30(10):477-482, Oct. 1975. 19 refs.*

The relationship between carbon monoxide exposure and heart attacks was investigated in a continuing study of sudden death and myocardial infarction in Baltimore. There was no evidence of clustering of either myocardial infarction or sudden arteriosclerotic heart disease (ASHD) on a specific day, nor was there a correlation between the number of cases/day and ambient CO levels. Postmortem carboxyhemoglobin (HbCO) levels were slightly higher in ASHD sudden deaths than in sudden deaths due to other causes. Any differences are probably primarily due to cigarette smoking. Cigarette smokers who died suddenly due to ASHD had substantially higher postmortem HbCO levels than nonsmokers. Practically all of the elevated HbCO levels were related to cigarette smoking or specific environmental exposure. There were no differences between HbCO levels in ASHD sudden death patients and in living controls. There was no relationship between cardiac pathologic findings and postmortem HbCO levels among patients dying suddenly of ASHD. (Author abstract modified)

61546 **APTIC NO. 83860**

Kumazawa, Yasumasa and Taichi Nakajima

STUDIES ON A COMBINED INDEX OF TOTAL AIR POLLUTION. *(Taikiosen- sogo shihyo ssettei no tameno kokoromi). Text in Japanese. In: Annual Report Osaka Prefectural Institute of Public Health and Labor Hygiene, p. 73-82, 1975. 11 refs.*

The correlation between the morbidity (corrected by age and smoking habit) of chronic bronchitis and the index of air pollution obtained by the method of H. Green was examined, using data from Osaka Prefecture. Air pollution was represented by the concentration of sulfur dioxide (pphm) and the amount of floating dust (microgram/cu m). There was a high linear correlation between the morbidity and the sulfur dioxide concentration. There was a high correlation between the value obtained by multiplying the concentration by the value of floating dust and the morbidity. There was a high correlation between the sum of the index of sulfur dioxide and that of floating dust and the morbidity.

61547 **APTIC NO. 80061**

Kunisato, H., M. Amimoto, R. Ebata, and Y. Tsunetoshi

RESULTS OF EPIDEMIOLOGICAL INVESTIGATION OF CHRONIC BRONCHITIS. *(Manseikikanshien no ekigakuchosa ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):487, Nov. 1975.*

The relationship between the environmental concentration of sulfur dioxide and the morbidity of chronic bronchitis of 13,671 inhabitants between age 40 and 70 in Akaho City was investigated in 1974, as for the past 4 years. The morbidity of chronic bronchitis became higher as the age and the amount of smoking increased in both sexes; the corrected morbidity was 3.0% - 4.5% in men and 1.6% - 2.9% in women with an overall average of 2.3 - 3.5%. There was no local difference in the morbidity of chronic bronchitis in the city, and no significant change in the environmental concentration of sulfur dioxide since 1970. The frequency of obstructive disturbance in local groups became higher as the age of subjects increased; higher in the smoking group than in the non-smoking group. The frequency of obstructive disturbance in chronic bronchitis patients was 16%, coinciding with that found in other cities.

61548 **APTIC NO. 83241**

Kurata, A., H. Miyachi, H. Oda, H. Nogami, and Y. Nakajima

PATHOHISTOLOGICAL FINDINGS IN MOUSE EXPOSED TO NITROGEN MONOXIDE FOR LONG PERIOD. *(Issankachisso choki bakuro mouse no byorisoshikigaku-teki shoken). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):470, Nov. 1975.*

Female mice (JCR-CIR strain), 4 weeks old, were continuously exposed to nitrogen monoxide for 6.5 months, and several pathohistological examinations were carried out on the sacrificed mice immediately, then 2 weeks, 2, 4 and 6.5 months after the exposure. Pathohistological findings were obtained in the respiratory system, mainly consisting of changes of the bronchial mucous epithelium and alveolar septa. On bronchi and bronchioli, degeneration, necrosis and proliferative response were observed, accompanied by fall-out of necrotic cells, papillous proliferation of epithelium, and clogging of bronchioli. Thickening and dilation of alveolar septa, consisting of hyperemia and partial hyperplasia of the alveolar lining cells, was found. Scattered images of pulmonary emphysema were also seen. Acidphilic change of the heart muscle, and seemingly hypooxygenic change of nerve cells in the cerebral cortex and cerebellum were seen; however, these changes were also seen in the control group. No conspicuous change was found in the liver, the kidney, or the spleen except for hemosiderosis in the spleen. The results showed the effect of NO gas on the respiratory system, especially obstructive respiratory disturbance from viewpoint of morphology. Because of the coincidence of pathological images due to exposure to nitrogen dioxide, the present findings could not be judged to have been due only to nitrogen monoxide.

61549 **APTIC NO. 79655**

Kurlyandskiy, B. A., D. P. Partsef, and A. R. Chernomorskiy

DETERMINING THE DAILY AVERAGE MAC OF TRICRESOL IN THE AIR. *(K metodike opredeleniya srednesutochnykh PDK trikrezola v atmosfernom vozdukhe). Text in Russian. Gigiena i Sanit., no. 5:85-87, 1975. 3 refs.*

Rats were exposed to different concentrations of tricresol vapors in acute and chronic experiments to determine the MAC value as a daily average for this pollutant in the air. Acute exposure to concentrations of 0.1 mg/cu m and over, and chronic exposure to 0.05 mg/cu m revealed functional changes of the organism, such as increased Neutral Red retention by the lung tissues, denaturation of proteins, increases in the gas exchange and in the neuromuscular excitation threshold. In view of the experimental findings, the daily average MAC for tricresol is recommended to be set at 0.005 mg/cu m.

61550 **APTIC NO. 83187**

Kurokawa, M., T. Aso, H. Mimura, K. Aiha[illegible], M. Kaneko, Y. Saiki, S. Nishiyama, Y. Himi and S. Su[illegible]o

ON THE CONCENTRATION AND THE EYE STIMULATING ACTION OF FORMALDEHYDE IN RAIN WATER. *(Kou chu no formaldehyde nodo to me ni taisuru shigekisei ni tsuite). Text in Japanese. (Kanagawa-ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.), no. 7:34, Dec. 1975.*

Although the content of free acid in the recent rain water was small, that of aldehydes was considerable (0.23-0.67 ppm formaldehyde; 0.052-0.070 ppm acrolein). Aldehyde-containing dilute sulfuric acid with a pH of 2-5 was dropped into the eyes of subjects (1-10 ppm of formaldehyde; 0-1 ppm of acrolein). The stimulating action of the dilute sulfuric acid was found to be fortified by the addition of the aldehyde at every pH, and at pH of 4 at which the dilute sulfuric acid caused almost no stimulation, the addition of more than 3 ppm of formaldehyde or of more than 0.3 ppm of acrolein caused stimulation at a higher frequency.

61551 **APTIC NO. 83792**

Kusumoto, S., Y. Tsubota, E. Yonekawa, H. Oda, H. Nogami, and Y. Nakajima

COMPARISON OF THE EFFECTS OF EXPOSURE OF MOUSE TO PHOTOCHEMICAL OXIDANT AND OZONE. PART 2. *(Kobagaku oxidant to ozone no mouse ni oyobosu eikyo no hikaku Part 2). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):473, Nov. 1975. 1 ref.*

Groups of mice were exposed to photochemical oxidant at 0.4-0.7 ppm and to ozone at 0.4-0.7 ppm and at 3 + or - 0.3 ppm for about 3 hr. Blood was sampled from the orbital venous network and examined. In the blood sampled just after exposure, ALP (magnesium-activated type) activity fell significantly in groups exposed to ozone at 0.3 ppm and to oxidant. The activity of 2,3-DPG declined only after exposure to oxidant. Serum cholesterol and urea-type nitrogen significantly increased in the ozone group, but not in the oxidant group. After 24 hr of exposure, the white blood cell count, index of WBC, red blood cell count, and ALP returned to the levels of the control group. The 2,3-DPLT(2,3-diphosphoglyceric acid) showed a tendency to increase. These findings suggests that the effects of oxidant on organisms are not the same as those of ozone.

61552 **APTIC NO. 79664**

Leutz, Janet C. and Harry V. Gelboin

BENZO(A)PYRENE-4,5-OXIDE HYDRATASE: ASSAY, PROPERTIES, AND INDUCTION. *Arch. Biochem. Biophys., vol. 168:722-725, 1975. 27 refs.*

A simple, rapid, and sensitive assay is described for rat liver benzo(a)pyrene-4,5-oxide hydratase, an enzyme converting benzo(a)pyrene-4,5-oxide to benzo(a)purene-4,5-dihydro-4,5-diol. The amount of the diol formed is constant with time and protein concentration and is equal to the oxide consumed. The enzyme has no requirements for oxygen or nicotinamide adenine dinucleotide phosphate and is inhibited by 1,1,10 trichloropropylene oxide. The intact enzyme is highly resistant to destruction by proteases, but becomes susceptible to pronase digestion after treatment with detergent. The enzyme is inducible by phenobarbital but not by 3-methylcholanthrene, both inducers of aryl hydrocarbon (benzo(a)pyrene)hydroxylase, which demonstrates the ability to alter the ratio of hydratase to the coupled mixed function oxygenase. A changed ratio of these two activities alters benzo(a)pyrene metabolism. (Author abstract modified)

61553 **APTIC NO. 76521**

Lipetz, Jacques and Owen B. Douglass, Jr.

THE RELATION OF SOLUBLE LEAD TO TOXICITY: AN IN VITRO ANALYSIS. *Chem. Biol. Interactions (Amsterdam), 11(2):117-122, Aug. 1975. 17 refs.*

Cells of human origin maintained in vitro in a phosphate free medium remain viable for over 24 hr but lose viability rapidly in the presence of soluble lead. The threshold for this loss of viability is less than 1 ppm. The cells maintain their viability in the presence of positive calcium ions. Soluble lead appears far more toxic than particulate lead. The protective action of the positive calcium ion in lead toxicity is apparently not specific to any cell type. (Author abstract)

61554 **APTIC NO. 81508**

Litvinov, N. N., P. F. Bugryshev, and V. F. Kazenashev

THE TOXIC PROPERTIES OF CERTAIN SOLUBLE BERYLLIUM COMPOUNDS. (ACCORDING TO THE DATA OF EXPERIMENTAL-MORPHOLOGICAL INVESTIGATIONS). *(O toksicheskikh svoystuakh nekoterykh rastvorimykh soyedinenig berilliya). Gigiena Truda i Prof. Zabolevaniya, no. 7:34-37, July 1975. 22 refs. Translated from Russian, 7p.*

Albino female rats were subjected to inhalation exposure of beryllium fluoride (0.4-0.04 mg Be/cu m) and beryllium chloride (0.2-0.02 mg Be/cu m) daily (five times per day) over a period of 4 mo. The exposures resulted in chronic interstitial pneumonia, pneumosclerosis, and benign as well as malignant tumors. The pneumosclerosis exhibited a diffuse character but was significantly more pronounced in the peribronchial and perivascular tissues. Pulmonary tumors developed in 57% of the animals 12-18 mo after termination of beryllium exposures ranging from 0.02-0.4 mg/cu m and in 28% of the animals during the chronic administration of beryllium in concentrations ranging from 0.04-0.02 mg/cu m. (Author conclusions modified)

61555 **APTIC NO. 83987**

Lugovoy, V. S.

TOXICOLOGICAL DATA ON NITRIC OXIDE IN ACUTE AND CHRONIC EXPERIMENTS. *(Materialy k toksikologii okisi azota v ostrom i povtornykh opytakh). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 4:52-53, 1975. 4 refs.*

The acute and chronic toxicity of inhaled nitric oxide was studied in rats. Acute poisoning tests with single-time inhalation revealed an LC50 of 1.068 mg/l, and LC16 of 0.68 mg/l, and an LC84 of 1.45 mg/l. The threshold concentration, determined by blood methemoglobin test, was 0.05 plus or minus 0.0012 mg/l. Compared with a control, significant changes (reduced gain in weight, disturbances in the functions of the central nervous system, reduced oxygen consumption, increased methemologin level, and increases in the weight coefficients of the lungs, liver, kidneys and testes) were observed in rats having inhaled NO in 0.05 mg/l concentration 6 hr a day, 5 days/wk, for 7 wk. No such changes were observed in rats exposed to 0.03 mg/l concentration.

61556 **APTIC NO. 81551**

Mabuchi, Yoriko and Mieko Ikawa

FATE OF VANADIUM IN RAT ORGANS. (2) VANADIUM ACCUMULATION IN RAT ORGANS. *(Vanadium no seitainai un-mei (2) Chikusekisei no u-mu). Text in Japanese. Tokyo Eisei Kenkyusho Nenpo (Annu. Rep. Tokyo Met. Res. Lab. Pub. Health), 26(2):96-102, 1975. 11 refs.*

Three experiments on the fate of vanadium administered intraperitoneally as an aqueous solution of sodium metavanadate to Wistar-JCL rats are described. After a single administration of 4 mg V/kg, the vanadium content of organs was determined at intervals. The content was highest in the kidney, followed by the bones and liver. The increase and decrease of the content were rapid, except in the bones. After continued administration for 7 days, once a day at 4 mg V/kg, the content of vanadium decreased rapidly for the first 10 days and then the decrease became slower; in the kidney and liver the content had not attained zero after 180 days. The content in the bones was relatively large after 180 days. After one, two and three days, respectively, of pre-administration of 3.4 mg V/kg to males and 3.1 mg V/kg to females, 20.3 mg V/kg to males and 18.6 mg V/kg to females were administered to determine the mortality for rats to which pre-administration was performed 2 days before the proper administration.

61557 **APTIC NO. 53087**

Mackova, O. and Z. Vlc

THE INCIDENCE OF RECURRENT AIRWAYS INFECTIONS AND CHRONIC BRONCHITIS IN CHILDREN OF AN URBAN COMMUNITY. *(Vyskyt recidivujicich zanetu dychacich cest a chronicke bronchitidy u deti v obvodu mestskeho sidliste). Text in Czech. Studia Pneumol. Phtiseol. Cech., 35(9):587-590, 1975. 6 refs.*

Morbidity varied according to age groups in 891 children aged 2-15 yr. Recurrent disease declined with increasing age while chronic disease rose. There was an adverse effect on morbidity in children sent to nursery school at preschool age. Chronic disease was diagnosed in 0.9% of the children, while recurrent airway disease was found in 2.5% of the children.

61558 **APTIC NO. 84053**

Maejima, Kazuhito and Masanori Matsuno

STUDY ON BIOLOGICAL EFFECT OF PLATINUM CATALYST PARTICLES EXHAUSTED IN THE AIR *(Haikijokayo hakkin shokubai no seibutsu eikyo ni kansuru kenkyu). Text in Japanese. Nippon Jidosha Kenkyujo Kenkyu Sokuho (Res. Lett. Japan Automob. Inst.), no. 38:1-13, Oct. 1975. 11 refs.*

Preliminary experiments aimed at predicting the effects on humans of particles of platinum catalyst from auto exhausts are described. Eight groups of male Wistar rats with 6 4-week old animals in each were fed the following diets for 47 days: (1) 20% cellulose, (2) 10% of cellulose, (3) 15% of the catalyst, (4) containing 10% of the catalyst, (5) 20% alumina, (6) 15% alumina (7) 10% alumina. No toxic symptoms or deaths were found during 47 days. Intake of food and water was lowest in group (1). The rate of weight increase was lowest in group (2). Platinum was detected mainly in the digestive and excretory organs and the brain and testis. There was no difference of pathohistological findings between the groups, although some pathohistological findings in the kidney and liver were noticed in all autopsies. The toxicity of platinum to human beings is discussed, with reference to the possible platinum intake and the known toxicological data for animals. The probable maximal intake of platinum from auto exhaust is probably not a grave hazard to mankind but should be further studied.

61559 **APTIC NO. 79622**

Maeshima, K. and M. Matsuno

STUDIES ON THE BIOLOGICAL EFFECTS OF PLATINUM CATALYST FOR CLEANING AUTO EXHAUST. *(Haikigas jokayo hakkin catalyst no seibutsu eikyo ni kansuru eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):478, Nov. 1975.*

The effects of secondary environmental pollution by microparticles from the catalytic apparatus used for cleaning auto exhaust were studied in experiments using p.o. administration of catalyst components to male rats of the Wistar strain. A mixture of gamma-alumina (99.8%) and platinum (0.2%) was mixed with daily diet at concentrations of 20, 15 and 10%, and alumina alone was mixed with daily diet at 20, 15 and 10%. These diet mixtures were fed to groups of rats for 47 days. The results were: (1) no case of poisoning with death was found and no change in body weight-time curve as compared to the control group given daily diet containing 20 and 10% of non-nutritive cellulose); (2) the group fed a diet containing platinum showed a tendency to growth inhibition, (3) platinum was detected in large amounts in the gastrointestinal system, and in other organs, in concentrations characteristic of the organ, and (4) no significant findings were obtained with the groups fed the diet containing only alumina.

61560 **APTIC NO. 83151**

Maier, Paul E.

FUEL-AIR MIXTURE CONTROL. *(Assignee not given.) U. S. Pat. 3,888,215. 4p., June 10, 1975. 1 ref. (Appl. July 16, 1973, 1 claim).*

An improved fuel-air mixture control for connection between the control unit and a temperature sensor of a fuel injection system of a vehicle is described. The control is located adjacent the area occupied by the vehicle operator and has a selector switch which selectively disconnects the temperature sensor from the control unit and connects the control unit to a variable resistor. Unlike other devices, this control device allows for manual adjustment of the fuel mixture of the fuel injection system during operation of the vehicle and is simple and inexpensive to manufacture, install, and operate. (Author abstract modified)

61561 **APTIC NO. 84692**

Makino, K.

A PROPOSAL OF A NEW COMBINED INDEX, PI, FROM CORRELATION BETWEEN PHOTOCHEMICAL SMOG AND SUBJECTIVE SYMPTOMS, AND ITS BASIS. *(Kokagaku smog to jikakushojo no sokan karano atarashii fukugo- shihyo no teisho-Pi to so no konkyo). Text in Japanese. In: Report on the Results of Studies on Environmental Pollution II. Tokyo Metropolitan Public Health Research Lab. (Japan.), p. 19- 24, July 1975.*

Based on the questionnaires on subjective symptoms due to photochemical smog in 850 children of kindergartens, primary schools, middle schools, and high schools in Meguro Ward, Toky[illegible]tropolis from July 1972 to June 1973, studies were carried out to establish a new combined index which is more appropriate than oxidant concentration now utilized as an index of photochemical smog. Oxidant concentration had a high correlation with several subjective symptoms such as pain in eyes, lachrymation, pain in throat, headache, and sensing exotic odors, and ambient temperature had almost as high a correlation to the same symptoms. An index which combined oxidant concentration and ambient temperature was devised: that is, the sum of oxidant concentration (ppm) and ambient temperature (C) minus 22 and divided by 6 (at ambient temperature more than 22 C), or oxidant concentration (ppm) divided by 6 (at ambient temperature less than 22 C). This combined index, PI, had a higher correlation with the complaint frequency of the above symptoms than oxidant concentration. When PI becomes larger than 4, the frequency of complaints of subjective symptoms suddenly increases. In this sense PI can be considered a threshold value.

61562 **APTIC NO. 84695**

Makino, K.

EXPERIMENTAL STUDIES ON EYE-IRRITATION ACTION BY PHOTOCHEMICAL SMOG PART II. *(Kokagaku smog ni yoru gan-shigekisayo no jikkenteki kenkyu Part II). Text in Japanese. In: Report on the Results of Studies on Environmental Pollution II). Tokyo Metropolitan Public Health Research Lab. (Japan), p. 9-16, July 1975.*

Twelve male volunteers including 3 smokers were exposed to auto exhaust (corresponding to 40 km/hr) irradiated by ultraviolet light while oxidant, ozone, sulfur dioxide, nitrogen oxides, carbon monoxide, hydrocarbons, floating dust were monitored. Ten female volunteers were also exposed, however, ozone and nitrogen were not monitored in these cases. After 2 min of exposure, their subjective symptoms in eye-irritation were divided into sensations of foreign matter and eyeache. Eye- irritation was closely connected to the formation of oxidant or ozone as well as to ambient temperature. A synthetic index of eye-irritation could be defined by combining oxidant or ozone with ambient temperature. Individual differences were (expectedly) large, especially sex-difference. Galvanic skin response, which has been used as an index of psychological action, was found to be useful in the study of eye-irritation by photochemical smog.

61563 **APTIC NO. 83977**

Malenkij, W. P.

HYGIENIC ASSESSMENT OF DUST IN FIELD-CROP CULTIVATION AND ITS EFFECT ON THE RESPIRATORY ORGANS. *(Gigienicheskaya kharakteristika Pilevovo Faktora B Polyewotstvye I Yevo Vliyanye Na Organi Dikhania). Text in Russian. Gigiena i Sanit., no. 8: 66-70, 1975. 21 refs.*

The effect of dust during agricultural operations on the respiratory tract is discussed. Dust formed during field activity is a complex, highly dispersible aerosol with a clear-cut biological effect verified by clinical examination. It consisted of organo-mineral admixtures with vegetable particles of great pathological significance. Dust penetrating the respiratory tract cause chronic disorders of the mucosa, chronic pneumonia, diffuse pneumosclerosis (with separate silicotic nodules), pulmonary emphysema, and allergies. Microorganisms entering the respiratory tract are believed to cause farmer s lung, or grain fever. Dust aerosol could be important in the etiology of general, non-specific sickness, and toxic chemicals (insecticides, fungicides, herbicides) found in the dust could affect the immune reactions of the organism, creating the basis for a variety of diseases, including those of the respiratory system. The dust arising as a result of agricultural labor should not exceed 4 mg/cu m, independent of its content of free silicon dioxide.

61564 APTIC NO. 80062

Maruya, H. and N. Ueoka

RESULTS OF HEALTH EXAMINATION ON SCHOOLCHILDREN IN KURASHIKI CITY PART 5. RESULT OF INVESTIGATION BY INQUIRY AND THE DISCUSSION ON METHODS OF INVESTIGATION ON HEALTH. *(Kurashiki-shi jidoseito no kenko chosa V: Enquete chosakekka to chosahoho no kento). Text in Japanese. Taiki osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):485, Nov. 1975.*

The health of 50,000 schoolchildren in Kurashiki was investigated by questionnaire in 1974, and the results were compared to data from medical histories. The frequency of complaints about respiratory symptoms was significantly higher in areas neighboring factories than that in a control group. The frequency of complaints about stridor was higher in the Mizushima area and in the central part of Kurashiki City than in the outskirts of the city. The frequency of complaints about repeatedly occurring infectious diseases of the respiratory system showed the same tendency. It was concluded that the content of Fletcher s questionnaire table is insufficient for investigation of health effects of air pollution on children, and that it is indispensable to investigate symptoms of chronic infectious diseases.

61565 APTIC NO. 82363

Maruya, Hiroshi

THE AIR POLLUTION AND RESPIRATORY DISEASES IN MIZUSHIMA, KURASHIKI CITY, OKAYAMA. *Preprint, Science Council of Japan, p. 45, 1975. (Presented at the International Congress of Scientists on the Human Environment, Kyoto, Japan, Nov. 17-26, 1975.)*

Petrochemical and steel plants were constructed in Mizushima in 1961. The number of chronic obstructive lung disease patients has increased since then with the intensified air pollution, including dusts and oxides of sulfur nitrogen. Many people of Mizushima suffered asthma-like attacks in 1972, including younger people. Schoolchildren were more significant in the population suffering asthma-like attacks than in other places distant from the plants. (Author abstract modified)

61566 APTIC NO. 83239

Maruya, Hiroshi

THE AIR POLLUTION AND RESPIRATORY DISEASE IN MIZUSHIMA, KURASHIKI CITY. *Preprint, International Congress of Scientists on the Human Environment, p. 45, 1975. (Presented at the International Congress of Scientists on the Human Environment, Kyoto, Japan, Nov. 17-26, 1975.)*

The Mizushima petrochemical and steel plants were constructed in 1961. Air pollution was intensified with their operation. The number of patients suffering colds increased with the intensified air pollution by sulfur oxides, nitrogen oxides, dusts, and other pollutants. Many people of Mizushima suffered from asthma-like attacks in 1972. Schoolchildren were a more significant part of the population affected by asthma-like attacks than in localities distant from the plants.

61567 APTIC NO. 80200

Mason, Thomas J.

CANCER MORTALITY IN U. S. COUNTRIES WITH PLASTICS AND RELATED INDUSTRIES. *Environ. Health Perspect., vol. 11:79-84, June 1975. 12 refs.*

Counties in the United States with chemical establishments whose primary manufacturing processes use vinyl chloride are identified. Site-specific cancer mortality comparisons reveal an excess of multiple myeloma in males associated with two of the manufacturing categories, synthetic rubber and synthetic fibers. A causal relationship between these manufacturing categories and multiple myeloma was not established. There is need for an industry based assessment of the occupational contribution to this excess to evaluate the etiologic importance of this relationship. (Author abstract modified)

61568 APTIC NO. 83489

Matsushita, Toshio, Yoshiki Arimatsu, Atsushi Ueda, Kazuko Satoh, and Shigeru Nomura

HEMATOLOGICAL AND NEURO-MUSCULAR RESPONSE OF WORKERS EXPOSED TO LOW CONCENTRATION OF TOLUENE VAPOR. *Ind. Health (Japan), 13(3):115-121, Sept. 1975. 19 refs.*

The hematological and neuro-muscular response of female shoe makers exposed to 60-100 ppm concentrations of toluene vapor were investigated. Subjective symptoms of the exposed group were significantly different from those of a control group; exposed subjects experienced general weakness, dysmenorrhea, itching, dermatitis of the hands, and feelings of uneasiness about solvent vapors. Hematological findings revealed no significant difference between groups, except for the appearance rate of Mommsen s toxic granules in peripheral neutrophiles. The mean value and standard deviation of hippuric acid concentration in the urine were 3.26 + or - 0.82 microgram/ml in the exposed group and 0.35 + or - 0.24 microgram/ml in the control group. There were significant differences between groups in neutrologic and muscular function tests, such as the abnormal tendon reflex, grasping power, tapping coordination, and agility of the fingers. The TVL of 1[illegible] ppm for toluene adopted by the Japan Association of Industrial Health needs reconsideration. (Author abstract modified)

61569 APTIC NO. 80155

Mencel, S. J. and R. H. Thorp

A STUDY OF BLOOD LEAD LEVELS IN THE SYDNEY METROPOLITAN AREA. *Clin. Exp. Pharmacol. Physiol., 2(5):444, Sept.-Oct. 1975. 3 refs.*

Blood lead levels in the Sydney, Australia metropolitan area were measured in 132 adults. The mean blood level was 12.4 microgram/dl. The total population consisted of 42 munitions workers from Sydney suburb with a mean value of 10.4 microgram/dl; 55 university students with a mean value of 10.5 microgram/dl; and 36 city workers with a mean of 17.6 microgram/dl. The mean Pb blood values for city workers compared well with the mean Tasmania urban blood Pb value of 17.4 microgram/dl, but suburban levels were lower. Levels of Pb in the air in urban environments made a significant contribution to the body burden of Pb.

61570 APTIC NO. 82250

Mochizuki, S.

ACTUAL CIRCUMSTANCES OF TAKING CHARGE OF BRONCHIAL ASTHMA PATIENTS. *(Kikanshizensoku kanri no jitsujo). Text in Japanese. Min-I-Ren Iryo (J. All-Jap. Leagues Democr. Med. Inst.), no. 43:18-20, 1975.*

In Sept. 1975, 234 in hospital outpatients in Nagano City suffering from bronchial asthma were surveyed. School age subjects numbered 151 males and 83 females. Of these, 78 were patients in 1975, with the most frequent onset in Sept. Acute cases numbered 145. The percentage that suffered allergic disorders in infancy was determined. Pulmonary emphysema, chronic bronchitis, and bronchiectasis appeared around age twenty and peaked in the seventies. Intracutaneous allergy tests showed that the effects of H. D., chrysanthemum, and common ragweed decreased in that order. Results of treatment are described.

61571 APTIC NO. 80350

Mifuda, S., M. Sato, T. Tachibana, T. Fujino, T. Miyazaki, M. Fujii, and H. Ikebe

RESULTS OF HEALTH EXAMINATION OF INHABITANTS IN SAGANOSEKI AREA.--ARSENIC CONTENT OF THEIR HAIR. *(Saganoseki chiku jumin no kenko chosa.--Mohatsuchu no hiso ni tsuite). Text in*

Japanese. Oita-ken Kogai Eisei Senta Nenpo (Ann. Rept. Environ. Pollut. Public Health, Oita Prefect.), no. 2:13-19, Aug. 1975

The hair of inhabitants in the Saganoseki area where a metals refinery has been located since 1916 was analyzed for arsenic. The subjects were women living in the area more than 15 years, who neither drank nor smoked. The arsenic content of the hair of women living near the refinery was, on the average, 0.24 ppm (1973) and 0.37 ppm (1973) with a highest value of 3.73 ppm; that of women living remote from the refinery was, on the average, 0.15 ppm (1973) and 0.18 ppm (1974) with a highest value of 1.84 ppm. The determination of annual concentrations of arsenic in floating dust yielded values of 0.0045, 0.037, 0.0151 and 0.0078 mg As/cu m in 1971, 1972, 1973 and 1974 respectively. The arsenic content of soil showed the same tendency as that of hair. The arsenic content of potable water was from 0.020 - 0.001 ppm, showing no relationship to the arsenic content of hair. It was concluded that although no air pollution due to arsenic exists now, the neighboring area was polluted in the past by smoke and dust containing arsenic from the refinery.

61572 **APTIC NO. 84505**

Miyabe, I.

NASAL DISEASES AND LUNG FUNCTION OF SCHOOLCHILDREN IN AIR POLLUTED AREAS AND NON-POLLUTED AREAS, ESPECIALLY THE DIFFERENCE OF RESPIRATORY RESISTANCE AND CONCENTRATION OF CARBON MONOXIDE IN EXPIRED AIR. PART II. *(Taikiosen chiku to hiosenchiku ni okeru gakudo no bishikkan to haikino ni tsuite, tokuni kokyu teiko to kokigas CO nodo no saini tsuite). Text in Japanese. Kanagawa Igakukai Zasshi (J. Kanagawa Med. Assoc.), 3(1):108, 1975.*

In 1974, findings on nasal cavity, rhinogram, vital capacity, and respiratory resistance of normal primary schoolchildren and those suffering from chronic sinusitis were compared in 5 subjects in both sexes of the 5th year class living respectively in the Kawasaki, Tsurumi, and Yamakita area. No difference in respiratory resistance was found between normal and suffering children in all three areas, and girls showed a littler higher value than boys. All the values of those in Kawasaki were more than 4 cm H2O/l/sec, however, the values in other areas were less than 4 cm H2O/l/sec. Between the findings in Tsurumi and Yamakita no difference in air pollution-caused nasal diseases. Except for a few children, the concentration of carbon monoxide in expired air was less than the limiting value of 10 ppm and no difference was found between sexes and morbidity of nasal diseases. It was found that in the Tsurumi area almost all cases (19/20) were less than 6 ppm (average of 4.2), far less than that in Kawasaki (7.3) and in Yamakita (8.0 ppm); however, the values were proportional to the concentration of carbon monoxide in the room where the examination was carried out.

61573 **APTIC NO. 84052**

Miyatake, K.

STATISTICAL OBSERVATION ON INFANTILE BRONCHIAL ASTHMA IN SHIN-NAKAHARA HOSPITAL. *(Shinnakahara Byoin ni okeru shonikikanshizensoku no tokeiteki kansatsu). Text in Japanese. Min-I-Ren Iryo (J. All-Jap. Leagues Democr. Med. Inst.), no. 43:17-18, 1975.*

Statistical analysis of case histories of 41 boys and 26 girls suffering from asthma in the heavily air-polluted industrial city of Kitakyushu are reported. The distribution of the patients and of concentrations of sulfur dioxide are compared. Seventy % of the patients lived in an area where sulfur dioxide was more than 0.5 mg/sq m/day. About half of the patients had the first attack at ages between 2 and 4. The immediate causes of asthma attacks were meteorological factors, then mental and physical factors. Disease histories revealed that 86.8% of the patients had some allergic history including 21.3% with eczema, 20.2% with asthmatic bronchitis, and some with atopic dermatitis and allergic rhinitis. They were predominantly fed with mother s milk. Family histories revealed that 79.1% of the patients had some 3rd degree relatives with allergic diseases, including 33.6% with bronchial asthma and 26.2% with uticaria. Intracutaneous allergen tests showed a highest positive value of 73.4%, followed by 60.9% for candida and nearly 20% for penicillin, aspergillus, cotton, rust mat, buckwheat powder, and buckwheat hull.

61574 **APTIC NO. 79790**

Mizoguchi, I., M. Osawa, M. Fukuda, and N. Okawada

EXAMINATION BETWEEN LYSOZYME AND PH IN TEARS IN TIMES OF PHOTOCHEMICAL SMOG. *(Kokagaku smog ji no namida lysozyme to pH no kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):512, Nov. 1975.*

On occasions of photochemical smog on June 4, 9, and 19 (with July 4 as control) with respective oxidant concentrations of 0.11, 0.12, and 0.17 (control 0.03), ppm, tears were taken from groups of 39, 37, and 28 (control 39) high school pupils and their pH and lysozyme activity were determined. Lysozyme activity of June 19 was significantly lower than that of June 4 and 19 and July 4. The pH of June 19 was about the same as that of June 4, and the two values were significantly lower than those of June 9 and July 4. The mechanisms of reducing pH and lysozyme activity of tears were considered along with experimental results that showed egg-white lysozyme activity markedly increased with time of exposure to ozone at 0.02, 0.06 and 0.10 ppm. Further studies are needed to determine the pollutants in air during photochemical smog incidents.

61575 **APTIC NO. 80026**

Mizoguchi, I., R. Mikami, and S. Kudo

VARIATION OF SUBJECTIVE SYMPTOMS DUE TO PHOTOCHEMICAL SMOG. *(Kokagaku smog ni yoru jikakushojo no hendo). Text in Japanese. Taiko Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):500, Nov. 1975.*

Subjective symptoms that are indicators of acute effects of photochemical smog were studied for clues to identifying the complex effects of the contribution of each pollutant and meteorological factor to each symptom. By single correlation, it was found that oxidants and sulfur dioxide showed high correlation with many symptoms, although negative humidity showed correlation to the most common symptoms. Temperature and the unpleasantness index showed no significant correlation, and the index showed no high correlation with subjective symptoms. By multiple correlation, sulfate ion, aldehyde, and nitrate ion showed a high multiple correlation coefficient when combined with oxidants, sulfur dioxide, and SPM. The oxidant sulfate ion combination showed the highest multiple correlation coefficient to the two symptoms, pain in the throat and dyspnea.

61576 **APTIC NO. 84691**

Mizoguchi, I.

EXAMINATION OF HIGH RISK GROUP DUE TO PHOTOCHEMICAL SMOG. *(Kokagaku smog ni yoru high risk group no kento). Text in Japanese. In: Report on the Results of Studies on Environmental Pollution II. Tokyo Metropolitan Public Health Research Lab. (Japan), July 24-28, 1975.*

The results of correlation analysis on the health diaries of 515 pupils in a middle school in Setagaya Ward, Tokyo were examined. The records of air pollutant concentrations and of meteorological factors and the groups of pupils with high risk based on disease history were examined especially closely. The following symptoms with orthostatic regulatory disturbance were chosen: dizziness, illness upon standing, illness when hearing or looking at disagreeable things, illness accompanying small movement, tendency to palpitate and to gasp, and difficulty in waking up in the morning with five minor symptoms including paleness, loss of appetite, headache, carsickness, and tiredness. This selected group had the most complaints. The other groups, such as those having allergic disease history and those having disease history of asthma were also selected. The response of these groups to air pollution was described in detail; however, the response to higher concentrations of oxidant must be studied further.

61577 **APTIC NO. 81501**

Moiseyev, G. E. and V. E. Benemanskiy

CONCERNING THE CARCINOGENIC ACTIVITY OF SMALL CONCENTRATIONS OF NITROSODIMETHYLAMINE DURING INHALATION. *(O kantserogennoy aktivnosti malykh kontsentratsii nitrozodimetilamina pri ingalyatsii). Vopr. Onkol., 21(6):107-109, 1975. 13 refs. Translated from Russian, 5p.*

The carcinogenic activity of small concentrations of nitrosodimethylamine was assessed by continuously exposing Wistar rats and mice of the Balb/c line to inhalation levels of the compound ranging from 0.005-0.2 mg/cu m. A concentration of 0.2 mg/cu m of NDMA resulted in an increased frequency of neoplasms as well as individual histomorphological types of tumors in mice and rats. This dosage also increased the frequency of malignant tumors in male rats. The tumors in animals exposed to the compound were localized mainly in the kidneys, lungs, and liver. Tumors occurred in exposed animals during the first half of their life span, while control animals showed tumor occurrence during the second half of their life span. Nitrosodimethylamine concentrations of 0.005 mg/cu m exerted no influence on the frequency of tumors and their localization. Wistar rats were more sensitive to NDMA than mice.

61578 **APTIC NO. 82225**

Motomiya, T., M. Adachi, R. Yoshida, and M. Nagasaki

RELATIONSHIP BETWEEN THE MORBIDITY OF BRONCHIAL ASTHMA AND AIR POLLUTION ON PRIMARY SCHOOL BOYS AND GIRLS IN TOKYO METROPOLIS. *(Tokyo to ni okeru gakudo kikanshizensoku yushoritsu to taikiosen tono kankei). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 22(10):414, Oct. 1975.*

The morbidity of bronchial asthma for primary school boys and girls in a school within 1 km of a monitoring point for nitrogen oxides and sulfur oxides was investigated. Values for sulfur oxides, and falling dust were taken from the average for the 3 years before the survey. Values for nitrogen oxides were from the one-year average of 1974. In four primary schools, threefold regression formulae were obtained representing the morbidity as a function of three variables: concentration of sulfur oxide, nitrogen oxide, and falling dust. The morbidity equals a negative value for sulfur oxides concentration multiplied by 1.9839 plus falling dust multiplied by 0.0361 plus nitrogen oxides multiplied by 0.0609 plus 3,7885. A relationship was suggested between nitrogen oxides concentration and the morbidity of bronchial asthma.

61579 **APTIC NO. 76473**

Mueller, M., N. Konietzko, W. E. Adam, and H. Matthys

INVESTIGATION OF THE MUCOCILIARY CLEARANCE BY MEANS OF 99MTC- LABELLED SULFUR COLLOID. *(Die mucociliare Clearance der Lunge; untersucht mit radioaktiv markiertem Schwefelkolloid). Text in German. Klin. Wochsch., 53(17):815-822, Sept. 1, 1975. 31 refs.*

The mucociliary system of the lung was studied in eight normal subjects and 10 patients with chronic bronchitis, using sulfur colloids, labelled with 99m technetium. Time activity curves obtained over the central airways were interpreted by a model. In bronchitics the disappearance rate of the radioactive particles depends upon the pattern of deposition and the degree of airway obstruction. The effect of drugs influencing the mucociliary system was tested. A newly developed vagolytic substance was used which does not influence the mucociliary system and which slightly reduces the airway resistance in patients with chronic bronchitis at the administered dose. (Author summary modified)

61580 **APTIC NO. 83246**

Mukai, I.

SURVEY ON THE DAMAGE DUE TO AUTOEXHAUST PART 2. COMPARISON OF DAMAGES INSIDE AND OUTSIDE THE CROSSINGS. *(Jidosha haikigas higaichosa Part 2. Kosaten naigai betsu hikaku). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 22(10):402, Oct. 1975.*

The health and subjective symptoms of groups of inhabitants living inside (A) and outside (B) a radius of 50 m from an intersection of heavy traffic were compared during Aug. 24 - Sept. 29. Damages and subjective symptoms except cough, sputum, stuffy nose, dullness and anorexia were seen more frequently in A areas; symptoms with a morbidity over 30% were headache, heaviness in the head upon waking, forgetfulness, impatient feelings, dizziness, gasp, palpitation, and sleepiness in day time (the last symptom found significantly more often in A areas). Damage and symptoms, classified into eye-irritation, effects on nervous, respiratory, and circulatory systems, and disturbances of sleep, are seen more frequently in A areas. Auto exhausts are responsible for these effects.

61581 **APTIC NO. 84610**

Murakami, Kyoko, Shin Iwamoto, Akira Takamatsu, Kitsuko Noze, Teruyo Maeda, and Hisaaki Miyoshi

AIR POLLUTION CONTROL AND ITS EVALUATION IN SEVERAL CITIES OF YAMAGUCHI PREFECTURE DURING THE PAST DECADE. *(Kako 10 kenenkan ni okeru yamaguchiken shotoshi no taiki osen taisaku to sono hyoka). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):571, 1975. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 302.)*

The relation between health and air pollution over the past 10 years for 5 cities in Yamaguchi Prefecture is considered. The cities achieved soot control (a 10 ton limit) and sulfur dioxide control (a 0.5 mg standard). The rate of respiratory disease paralleled the decrease in dust and SO2. The death rate due to pneumonia and bronchitis decreased; the rate was 30/100,000 population from 1968 to 1972, well below the national average. The infant death rate also decreased with decreasing pollution, and deaths among infants shifted to younger ages. The death rate of older people also decreased, and mortality shifted to more advanced age. The morbidity of children with respiratory diseases decreased, and respiratory disease was shifted to lower ages.

61582 **APTIC NO. 82260**

Murayama, N. and Y. Koyama

COMPOUND POLLUTION DUE TO HEAVY METALS, GRINDING MATERIALS AND SULFUR OXIDES AND INHABITANT S HEALTH. *(Jukinzoku, kensakuzai, iosanka butsu nado ni yoru fukugo osen to jumin no kenko). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 22(10):407, Oct. 1975.*

Complaints about respiratory symptoms around a factory which produces more than half amount of Japan s grinding and fireproofing materials led to a survey of 336 residents living within 200 m of the factory and 132 living 600 m from the factory. Examination by BMRC and tests of sputum, urine, lung function, intracutaneous response, chest roentgenography, blood pressure, ECG, and hematological analysis showed higher morbidity of respiratory disturbances such as chronic bronchitis, more than 2 ml of early morning sputum, mucosal sputum, purulent sputum and hypoxic blood in the group near the factory. Amounts of sulfur oxides, nitrogen oxides and falling dusty soot were significantly larger as the distance from the factory was less. Falling dust contained ashes (about 45%) consisting of silicon carbide, alumina, ferric oxide, silica, sodium aluminosilicate, and oxides of chromium, zinc, copper, zirconium, vanadium, lead, molybdenum, and nickel.

61583 **APTIC NO. 82226**

Nagata, M., M. Ogawa, and T. Tsuji

FIVE YEARS RECORD OF MASS EXAMINATION OF LUNG FUNCTION ON SCHOOLCHILDREN IN AIR POLLUTED AREAS. *(Taikiosenchiku gakudo no haikino shuken 5 nenkan no seiseki). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 22(10):416, Oct. 1975.*

Results of 5 years (1970-1974) of examinations of lung function of schoolchildren in S city (pollution 49,000) of Gumma Prefecture are given. In Feb. 1970, the FVC and FEV1.0 of children in a school attended by children from the area around a group of factories were significantly lower than for children in a school located remote from the factory. The pollutants included sulfur dioxide, hydrogen chloride, and nitrogen oxides. The results of examination of lung function in recent years still show the lower values of FVC and FEV1.0 in A school although falling dust and sulfur dioxide were reduced. However, a tendency of yearly increasing of FEV1.0 in schools around the factories group was suggested which reflects the environment improving effect by continued monitoring.

61584 **APTIC NO. 84242**

Nagata, S.

THE AIR POLLUTION IN YOKKAICHI AND ITS MEASUREMENT METHODS. PART 1. SULFUR OXIDES. *(Yokkaichi-shi no taikiosen to sokuteicho. Part 1. Io sankabutsu). Text in Japanese. Kasei Kenkyu (Studies of Household Economics), no. 22:51-90, 1975. 27 refs.*

The history and the present state of air pollution, especially sulfur dioxide and sulfur trioxide contained in the exhaust from the coastal industrial zone are discussed. The methods used for determining sulfur are described. The effects of sulfur oxides on humans are described. A survey in the Isotsu area of Yokkaichi from Dec. 1962 to March 1963 identified local differences in the frequency of colds, bronchial asthma, laryngopharyngitis, and ocular diseases. There was a correlation between sulfur dioxide concentrations and the frequency of these diseases, with a correlation coefficient of 0.8-0.877. Sulfur oxides stimulate the mucous membranes of the pharynx, larynx, and bronchi, causing an obstructive disease called Yokkaichi asthma. A mixture of sulfur dioxide and sulfuric acid mist at more than 0.2 ppm causes the frequency of attacks to rise, resulting in disturbances to the heart, finally resulting in cor pulmonare. The effects of sulfur dioxide on cilia, resulting in microbial infections, which cause bronchitis are described. The alveolar ventilation is disturbed, resulting in hypoxia, due to smog.

61585 **APTIC NO. 83801**

Nagira, Tsuyoshi, Kazunori Hatada, Hideyasu Aoyama, and Masahiko Ohira

CITIZEN S MOVEMENT AGAINST ENVIRONMENTAL DISRUPTION CAUSED BY THE ROUGE-PRODUCTING FACTORY AT A RURAL DISTRICT. *(Ichinosonchiku ni okeru bengara kojo ni yoru kogai to jumin undo). Text in Japanese. Nippon Eiseigaku Zasshi (Japan J. Hyg.), 30(5):523-535, 1975. 31 refs.*

About 50% of Japan s iron oxide powder is produced in Okayama Prefecture, mostly by 3 neighboring factories in a narrow rural district. In the process of producing iron oxide powder, beginning with calcination of ferrous sulfate, sulfur dioxide, sulfur trioxide, and iron oxide dust pollut the ambient air, with the result that many inhabitants suffer various respiratory symptoms and diseases such as coughing, phlegm, stridor, dyspnea, asthmatic fits, pain in the throat, hoarse voice, colds and nasomucosal symptoms. Trees and herbs around the factories and on neighboring hills have withered. The history of environmental pollution is traced from 1954 to 1974, during which the production was once increased, then reduced; calcination was stopped late in 1971. At the most active period of the factory, concentrations of sulfur dioxide in air at the district were a maximal 7.45 mg sulfur trioxide/day/100 sq cm (PbO2 method), the highest value of sulfur dioxide ever determined in the air of Japan. After ceasing the calcination, concentrations of sulfur dioxide greatly decreased; however, there are still 0.1-0.4 mg sulfur trioxide/day/100 sq cm (PbO2 method), due to the exhaust of a heavy oil burning boiler. Detailed results of health examinations of the inhabitants, including chronic bronchitis, pulmonary emphysema, and bronchial asthma, are described. Movements of the inhabitants against the pollution are described in detail.

61586 **APTIC NO. 83806**

Nagumo, K.

ENVIRONMENTAL POLLUTION AND HUMAN DAMAGE BY CHROMIUM COMPOUNDS. *(Kuromu kagobutsu no kankyo osen to jintai hakai). Text in Japanese. Kenko Kaigi (Health Assem.), 27(10):8-20, 1975. 3 refs.*

The problem of environmental pollution due to chromium has been under review since water and soil of Horie-cho, Kotoku, Tokyo showed 94-103 ppm total chromium in stagnant water and 106-110 ppm of hexavalent chromium where the Nihon Chemical Co. buried a huge amount of chromium slag for land reclamation. The historical development of Nihon Chemical Co. as one of the largest chromium-treated firms is discussed. The health troubles of company employees, especially damage to the skin, the nasolaryngopharynx, and the lung, particularly the perforation of the nasal septum and lung cancer, are discussed. The damage is ascribed to solid airborne particles. Mutagenesis due to hexavalent chromium was suspected. There are records of health injury to residents here and around another chromium refinery in 1968. Precise medical examination is necessary for the inhabitants around the land reclaimed with chromium slag.

61587 **APTIC NO. 84675**

Nakagawa, S., S. Agasato, and C. Ikemi

ON THE EFFECT OF AIR POLLUTION ON THE OCCURRENCE OF INFANTILE ASTHMA DISEASES. *(Zensoku-yo shikkan hassei (jido) ni taisuru taikiosen no eikyo ni tsuite). Text in Japanese. Seishin Igaku (Psychiatry), vol. 1975:362, Dec. 1975. (Presented at the Psychosomatic Medicine Society, 16th Annual Meeting, Japan, 1975.)*

The effects of air pollution on the occurrence of infantile asthmatic diseases were surveyed in about 1,280,000 children in primary and middle schools in Kitakyushu by questionnaire and clinical examination. Screened patients (3.1%) were classified into 3 categories: I. (typical asthma with dyspnea and orthopnoea) II. without orthopnoea; and III. atypical-asthma without dyspnea. In spite of reduction of sulfur dioxide (56%) and dust fall (47%) from 1969 to 1973, the rate of asthma showed a tendency to increase, with typical asthma the highest (1.98%) in 1973. A baby 3 years old who had been exposed to heavy air pollution in 1969 becomes hypersensitive, and may become an asthmatic patient after 3 years. A higher percentage of typical asthmatic patients complained of anxiety about pollutants and feelings of uneasiness in highly polluted areas than did atypical asthmatic patients.

61588 **APTIC NO. 79623**

Nakamura, I. and Y. Takizawa

EFFECTS OF FLUORIDES ON RESPIRATORY SYSTEM OF RAT. *(Rat kokyukikei ni oyobosu fukkabutsu no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):479, Nov. 1975.*

Groups of adult female Wistar rats were exposed by inhalation to sodium fluoride at 13 mg/cu m and to calcium fluoride at 25 mg/cu m for 4 hr/day for, respectively, 10 days and 10 and 30 days. All the rats were sacrificed for 24 hours after the last exposure. The fluorine content of the urine of rats exposed to NaF increased rapidly, and that of CaF2 rats showed slower increase; the former at 10 days of exposure was 3.5 times higher than the latter. The fluorine concentration in serum was about 6 times higher in the NaF group than in the CaF2 group after one day of exposure; however, the absolute concentration 24 hours of the last exposure was about the same as that of the unexposed control. The fluorine concentration in the lung of rats exposed to CaF2 was higher than those in other organs and showed increase with exposure time, in contrast to that of the group exposed to NaF. The fluorine content of the femur of the rats exposed to NaF was significantly higher than that in the control group. Pathological findings include swelling of alveolar epithelium, reinforced omission of the alveovacuolar phagocyte, stagnation of acidphilic substances in the alveoli, aggregation of plasma cells around small vessels and proliferation of cells in the pulmonal septum, without, however, fibrous thickening or formation of hyaline membrane. These findings suggest species differences of fluorides in metabolism in the body.

61589 **APTIC NO. 83477**

Nakatsugi, T.

ON GUIDING THE RECUPERATION OF PATIENTS SUFFERING FROM OBSTRUCTIVE PULMONARY DISEASES AT A MEDICAL CENTER HAVING NO SICKBED, CENTERING ON PHLEGM-DRAINAGE BY THE POSITION OF THE BODY. *(Mushoshinryojo ni okeru heisokusei haisikkan kanja no ryoyoshido, tai-i drainage no haitanshido o chushin ni). Text in Japanese. Min-I-Ren Iryo (J. All-Jap. Leagues Democr. Med. Inst.), no. 43:29-30, 1975.*

A method of accelerating the drainage of phlegm and guidelines for phlegm-drainage by adjusting the position of the body are given. Phlegm-drainage is performed in the knee-chest position once in the morning for 20 minutes. The effects of such drainage included improved phlegm properties, and reduced frequency of stridor and asthmatic fits. Appetite and sleep were also improved. After one month of such exercise, the administering of bronchodilating agents became unnecessary.

61590 **APTIC NO. 79634**

Nakaya, S., K. Itaya, S. Sakurai, Y. Suzuki, and F. Tsunoda

STUDIES ON AIR POLLUTION DUE TO FLUORIDES PART 16. ON THE FLUORINE CONTENT IN URINE AND SERUM OF INHABITANTS AROUND PHOSPHATE FERTILIZER FACTORIES. *(Fukkabutsu ni yoru taikiosen ni kansuru kenkyu Part 16. Rin-hiryo kojo shuhen chiku jumin no nyochu kesseichu fusso nodo ni tsuite). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 22(10):399, Oct. 1975.*

The fluorine content in urine and blood serum of men and women living in the area of phosphatic fertilizer plants for more than five years, and of primary school boys in the 5th and 6th years of classes was determined. The area studied was within a radius of 1 km from a fused phosphatic fertilizer factory and within 2 km (to the SE), 2 km (to the NW) and 7.5 km (to the W) from a superphosphate factory. The fluorine content of urine and serum was higher as distance from the factory decreased; however, there were no data showing health impairment due to fluorine.

61591 **APTIC NO. 82228**

Nakaya, S., Y. Suzuki, K. Yazaki, K. Itai, S. Sakurai, and F. Tsunoda

EFFECT OF AIR POLLUTION MAINLY CONSISTED OF DUST ON THE HEALTH. *(Funjin o shu to suru taikiosen no kenko eno eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):505, Nov. 1975.*

Complaints of residents in B City and A Village about health impairment due to the exhaust from iron works have been incessant. The characteristic feature of air pollution in these areas is the low concentration of gaseous pollutants such as sulfur dioxide (0.01-0.02 ppm) and the high concentrations of solid pollutants (0.05-0.11 mg/cu m of floating dust and 100 tons of falling dust/month). Determination of lung function and ophthalmological examination of wives between age 40 and 59 and schoolchildren were carried out in 1974 in 5 local sections. In spite of frequent complaints of dyspnea, stridor, and bloody sputum, the morbidity of chronic bronchitis was relatively low. The frequency of expiratory impairment tended to be higher in areas of more abundunt dust-fall. The morbidity of ocular diseases showed no difference among the sections; however, the frequency of complaints about eye-irritation was very high in heavily polluted sections.

61592 **APTIC NO. 80066**

Nakayama, N., M. Ueda, and Y. Tsunetoshi

EFFECTS OF AIR POLLUTION ON THE HEALTH STATE OF SCHOOLCHILDREN. *(Taikiosen no gakudo no kenko ni oyobosu eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):484, Nov. 1975. (Presented at the Japanese Conference on Studies of Air Pollution, Niigata, Japan, Nov. 5-7.)*

The frequency of school absence of children with disease histories and existing asthmatic disease was studied in 3 different areas for which the degree of air pollution was determined. The average frequency of school absence was 7.1 days/yr, including 5.1 days due to respiratory diseases. The frequency was highest for asthma, followed by asthmatic bronchitis. A difference in the frequency of absence was seen between the allergic plus group and the allergic minus group. There was a tendency of increasing frequency of absence due to respiratory diseases in areas with heavier air pollution.

61593 **APTIC NO. 79581**

Nakazawa, S., T. Suzuki, M. Umeda, H. Goto, and S. Nagaoka

ON THE DYNAMIC STATE OF BRONCHIAL EPITHELIAL CELLS OF ANIMALS EXPOSED TO OZONE. *(Ozone bakuro ni yoru dobutsu kikanshi johisaibo no dotai ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):471, Nov. 1975.*

A group of SD-rats were exposed to ozone at 1 ppm 5 hr/day, for 5 days. During and the first and the third day after ending exposure they were sacrificed and bled, and the trachea washed to collect the ablated cells. In the collected and stained cells, the number of bronchial epithelial cells increased conspicuously at the first day of exposure, then slowly decreased to become the same as in the control group at the end of exposure. There was a reverse tendency for the appearance of histiocytes in the collected cells. These facts suggest that the number of degenerated and ablated epithelial cells in bronchi increased after exposure to ozone; however, the ratio of ablation decreased regardless of ozone exposure and normal levels were restored after ending the exposure. Histological changes included disappearance of epithelial cilia with ablation of many epithelial cells, then conspicuous proliferation and regeneration of epithelial cells, including goblet cells with partly pupillous arrangement, accompanied by increase of intrabronchial secretion.

61594 **APTIC NO. 83566**

Narang, Shashi, Jawahir L. Kaw, and Sibte H. Zaidi

INHIBITION OF CHRYSOTILE HEMOLYSIS BY POLYMERS. *Industrial Health (Japan), 13(3):105-108, Sept. 1975. 8 refs.*

Carboxymethylcellulose and polyvinylpyridine N-oxide were tested for their ability to inhibit chrysotile induced hemolysis.

Carboxymethylcellulose is an antagonist when used for pretreatment of asbestos dust as well as when the chrysotile erythrocyte interaction is allowed to take place in its presence. Pretreatment of erythrocytes with the polymer before their exposure to chrysotile does not prevent the hemolytic actions of chrysotile. Polyvinylpyridine N-oxide is antihemolytic to a lesser extent and only at higher concentrations. (Author abstract modified)

61595 **APTIC NO. 80165**

Nelson, Norton

INHALATION CARCINOGENICITY OF CHEMICALS. *Preprint, International Congress of Scientists on the Human Environment, p. 154, 1975. (Presented at the International Congress of Scientists on the Human Environment, Kyoto, Japan, Nov. 17-26, 1975.)*

The carcinogenicity of inhaled chemicals has been considered in connection with occupational exposures involving inorganic chemicals, organic chemicals such as vinyl chloride and bis(chloromethyl)ether, and radioactive substances. However, daily home exposure to asbestos has been implicated in cancer, and there is also concern that vinyl chloride used as an aerosol propellant may place users in danger of cancer. These issues are reviewed with several samples, in particular the carcinogenicity of halo ethers: bis(chloromethyl)ether and methyl(chloromethyl)ether.

61596 **APTIC NO. 83373**

Nikiforowa, Jelena

LEAD IN EXHAUST GASES. HAZARDS FOR THE TROPHIC CHAIN. *(Blei im Abgas. Gefahr fuer die Nahrungskette). Text in German. Exkat. Inform. Wiss. Tech. Sowjetunion, no. 6:22-25, 1975. 4 refs.*

General problems of exhaust lead emissions and the health hazards of lead are described. Lead concentration measurements conducted in West Germany, the U. S., Switzerland, and the USSR revealed very high concentrations in soil, on and in plants near busy highways. The contamination of plants is due to direct deposition of exhaust lead particles from the air, and to uptake from contaminated soil. While the exposure to lead in air and food is usually too low to cause acute poisoning, lead accumulates in the organism, and can cause chronic poisoning, which manifests itself through such symptoms as neurological disorders, fatigability, and impairment of the reflex functions. As it is technically unfeasible to use lead-free gasoline in automobiles, the contamination due to exhaust lead should be abated by means of hedges along roads. Due to increased exposure and contamination hazards, no plants should be grown for consumption within a 100 m-belt along busy roads and highways.

61597 **APTIC NO. 82229**

Nobutomo, K. and S. Ishinishi

RELATION BETWEEN AIR POLLUTION AND RESPIRATORY IMPAIRMENT. ITS DETECTION BY CYTOLOGICAL DIAGNOSIS OF SPUTUM. *(Taikiosen to kokyukishogai, kakutan saiboshin ni yoru kenshutsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution, 10(4):496, Nov. 1975.*

Cytological diagnosis of sputum indicated the presence of respiratory impairment by air pollution that consisted of the deterioration of the self-cleaning function of the lung and the inflammation of the airway by increased amounts of sputum. The reproducibility of the method and the application to cases where cough and sputum continued in spite of a low degree of air pollution is discussed. Although no problem was found with the reproducibility, no clear relationship was seen between the cytological findings in the non-polluted area and those in Omuta and Fukuoka Cities. However, after dividing the subjects into smokers and non-smokers, differences were found in alveolar phagocytes, neutrocytes and acidocytes.

61598 **APTIC NO. 83538**

Nogami, H., H. Oda, S. Kusumoto, E. Yonekawa, Y. Tsubota, and Y. Nakajima

EFFECTS OF LONG-TERM EXPOSURE OF MICE TO NITROGEN MONOXIDE. *(Issankachisso choki bakuro no mausu ni oyobosu eikyo). Text in Japanese. Preprint, Japan Pharmaceutical Assoc., Tokyo, p. 97-99, 1975. 3 refs. (Presented at the Environment-Polluting Substances and their Toxicology Symposium, 2nd, Gifu, Japan, Oct. 27-28, 1975.)*

To study the chronic effects of long-term exposure to nitric oxide, female mice (ICR-JCL strain) were exposed continuously to nitric oxide at 10 ppm (12.3 mg/cu m), starting from four weeks old and continuing for 2 weeks and for 2, 4, and 6.5 months. The mortality of exposed mice (4/60) was almost equal to that of the control (3/60). The findings which distinguished exposed from control mice were: 1) falling and yellowing of body hairs, 2) a significant increase of the weight ratio of the kidney to the total body from the second week of exposure, and a significant increase of the weight ratio of the lungs and the spleen to the total body in the second week and after 6.5 months of exposure, 3) a significant increase of WBC from the second week, 4) a higher total bilirubin from the second week, 4) some pathological alteration in the lungs of mice exposed for more than two months, accompanied by denaturation and a proliferatic reaction of the bronchial mucosa and, stagnation in the alveolar septum accompanied by thickening and enlargement, 5) proliferation in the brochioles and mamilla, and 6) obstruction of the bronchi by mucous after 4 months of exposure.

61599 **APTIC NO. 82224**

Nukada, Y.

ANALYSIS OF INFANTILE RESPIRATORY DISEASE SYMPTOMS ACCOMPANIED BY AIR POLLUTION - ANALYSIS OF APPLICATIONS FOR OFFICIAL RECOGNIZATION OF HEALTH IMPAIRMENT. *(Taikiosen ni tomonau shoni no kokyukishikkan no shojo no bunseki - Ota-ku no kenkoshogai nintei shinseisho no bunseki). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 22(10):415, Oct. 1975.*

From 597 cases of application for official recognization of health impairment, 14 items (name of disease, area, sex, age, onset year of disease, pyrexia, cough, sputum, gasp, dyspnea, and others) and 44 categories which represent detailed content were analyzed. A classification table was constructed by and scores were obtained from 30 by 30 correlation coefficients. The score with largest range was that of the difference by medical organization, followed by the name of the disease. The most frequent symptom was wheezing, followed by continued cough, hour of cough, dyspnea and difference of age. Local differences (continued sputum, presence of pyrexia) were far less numerous. It was concluded that the scores having a large range could be significant to a degree, and that it would be dangerous to pay more attention to scores with a small range.

61600 **APTIC NO. 79715**

Ochs, Hans-Joachim

VENTILATION AND EXTRACT SYSTEM IN GALVANIC PLANTS. *(Zu- und Ablueftung in galvanischen Betrieben). Text in German. Wasser Luft Betrieb, 19(7):400-402, 1975. 7 refs.*

Engineering aspects of ventilation and extract systems for galvanic baths and toxic effects of vapors emitted from such baths are described. Recommendations for the design and dimensioning of suction hoods, complete exhaust systems, and exhaust fans are given. Exhaust hoods should have a 45 deg opening to avoid excessive turbulence. Vapors emitted from chromium baths caused nosebleed, circulatory disturbances, cardiac disorders, irritation of the respiratory tract, and lung cancer. The maximum allowable concentration of these toxic substances is set at 0.1 mg/cu m. Cyanidic bath emissions are toxic for tissues and cause paralyses. The MAC value is 10 mg/cu m. Alkaline bath emissions, limited to 2 mg/cu m, irritate the respiratory tract, while pickling bath emissions, limited to 2 mg/cu m, irritate the respiratory tracts, teeth, eyes, skin, and cause gastric disorders. Emissions generated in brass-dipping operations irritate the lower respiratory tract, dilate the blood vessels, and cause cardiac disorders. The MAC value for these toxic emissions is set at 5 mg/cu m.

61601
APTIC NO. 79794

Oda, H., H. Nogami, S. Morimoto, Y. Tsubota, E. Yonekawa, and T. Nakajima

HEMATOLOGICAL AND BIOCHEMICAL EFFECTS OF LONG-TERM EXPOSURE TO NITROGEN MONOXIDE ON MOUSE. *(Issanka chisso choki bakuro no mouse ni oyobosu ketsuekigaku-teki seikagakuteki eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):469, Nov. 1975.*

Female mice (JCL-ICR strain) were exposed to nitrogen monoxide at 10 ppm (containing 1-1.5 ppm of nitrogen dioxide) continuously for 2 weeks, and for 2, 4, and 6.5 months. The results of hematological and biochemical examination of these mice showed no difference of body weight, RBC, total hemoglobin, hematocrit, GPT, total cholesterol, or urea-form nitrogen between exposed and non-exposed mice. An increase of the weight ratio of the lung and the spleen to total body weight was observed after 2 weeks and 6.5 months of exposure for lung and spleen respectively. White blood cell count showed a tendency to increase through the course of exposure. Total bilirubin showed significant increase after 6.5th months. Cholinesterase showed reduced activity at the 4th and 6.5th months. There was no difference of NOHb between the 6.5-month and one-hour exposure. The percentage of erythrocytes having Heinz bodies was 11.0% after exposure for 6.5 months as compared to 0% for the control group. Although the component of g equals 6 in ESR was observed, MetHb was not detected by spectroscopy (630 nm); instead, a peak at 620 nm (having no cyan bonding) was found. Oxygen dissociation curves suggested a slight decrease of affinity for oxygen in the exposed group.

61602
APTIC NO. 81513

Oda, Hajime, Hiroshi Ngogami, Shigeko Kusumoto, Etsuko Yonekawa, Yasuko Tsubota, Taichi Nakajima, Hideki Miyaji, and Akihiko Kurata

STUDY OF LONG-TERM EFFECTS OF NITRIC OXIDE ON MICE. *(Issankachisso no seitai ni oyobosu eikyo ni kansuru kenkyu). Prefectural Inst. of Public Health, Osaka (Japan), Div. of Environmental Health Research and Dept. of Pathology, Japan Environmental Protection Agency Contract, March 1975. 14 refs. Translated from Japanese, 22p.*

Female mice were exposed to 10 ppm of nitric oxide in a mixture also containing 1-1.5 ppm of nitrogen dioxide for periods of up to 6.5 mo. The exposed animals exhibited increased lung and spleen weights, higher white cell counts, higher total bilirubin values, and reduced cholinesterase activities along with degeneration and necrosis of the pulmonary and bronchial mucous membranes and subsequent hyperplasia of the epithelial cells. Hypertrophic enlargement of the alveolar septa due to hyperemia and congestion was also observed. Whether the observed changes were due to the action of NO alone is not known because of the possibility of participation by NO2. (Author summary modified)

61603
APTIC NO. 79988

Ohyama, Masaru, Yasuro Miyoshi, Sadasuke Gotto, Misako Hatada, Kunio Shoji, Mikikazu Yamagiwa, Kenzo Morikawa and Tsuyoshi Taniguchi

AIR POLLUTION AND VOICE FUNCTION OF PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASES. *(Taikiosen to mansei heisokusei haishikkan shorei no onsei kino). Text in Japanese. Jibi Inkoka Rinsho (Practica Otological Kyoto), 68(7):899-907, July 1975. 29 refs.*

A comparison of 22 patients with chronic obstructive pulmonary diseases to 17 patients with the same diseases but living in non-polluted areas, showed an abnormal incidence of voice disfunction and disturbance of the lower airway in both groups, but no significant difference between the two groups. There was a significant incidence of infectious diseases of the upper airway; the contribution of infection to diseases of the larynx was considered.

61604
APTIC NO. 79791

Okumura, T., M. Tsuda, M. Yokoyama, and T. Tsunetoshi

ON THE RELATIONSHIP BETWEEN COMPLAINTS OF SYMPTOMS DUE TO PHOTOCHEMICAL SMOG AND THE ATMOSPHERIC CONDITIONS PART 2. *(Shojo no uttae to taikijoken tono kankei ni tsuite, Part 2). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):511, Nov. 1975.*

Attention should be paid to the possibility of orthostatic disturbance among persons having subjective symptoms due to photochemical smog. Examination for orthostatic disturbance and examination of the circulatory system were carried out on middle school children in Osaka, and a questionnaire about such complaints was issued in April and June of 1974. Analysis of the results of examinations and subjective reports of symptoms indicated that there was no tendency to find more complaints from children who showed decreased blood pressure by orthostatic examination. There is need for further examination of the process by which a change of environmental conditions leads to complaints about subjective symptoms.

61605
APTIC NO. 80060

Okuya, H.

RELATIONSHIP BETWEEN MORBIDITY OF CHRONIC BRONCHITIS AND COMBINED AIR POLLUTION FROM STATIONARY AND MOVING SOURCES IN CITIES. *(Toshi ni okeru taiki-fukugo osen koteihasseigen oyobi ido hasseigen to yushoritsu to no kankei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):488, Nov. 1975.*

The sources of air pollution were divided into stationary ones such as factories which emit mainly sulfur dioxide and moving ones such as motor vehicles which emit mainly nitrogen oxides. An epidemiological survey of respiratory diseases was carried out on 10,800 residents randomly selected in Nagoya City. The local morbidity of chronic bronchitis was obtained by the BMRC method. The relation between the morbidity of chronic bronchitis and both types of pollution source was analyzed by a multiple regression method. It was found that the percentage of contribution of stationary and moving sources on the morbidity of chronic bronchitis was 95.9% and 4.1%, respectively. The contribution of air pollution to chronic bronchitis due to stationary sources predominated in Nagoya City.

61606
APTIC NO. 84697

Osawa, S.

STUDIES ON PHOTOCHEMICAL SMOG AND ERYTHROCYTES. *(Kokagaku smog to sekkekkyu ni kansuru kenkyu). Text in Japanese. In: Report on the Results of Studies on Environmental Pollution II. Tokyo Metropolitan Public Health Research Lab. (Japan), p. 7-8, July 1975.*

The effect of air pollution on erythrocytes was studied by exposing white male rabbits to ozone at concentrations of 2, 1, and 0.5 ppm for 3 hr/day continously for 4 days, and to toluene at 900 ppm for 3 hr, collecting their blood immediatley before and after, and 4 and 24 hr after the end of exposure, and by the determining osmotic resistance of erythrocytes with a cyclic path centrifuge. In the group exposed to ozone at 2

Carboxymethylcellulose is an antagonist when used for pretreatment of asbestos dust as well as when the chrysotile erythrocyte interaction is allowed to take place in its presence. Pretreatment of erythrocytes with the polymer before their exposure to chrysotile does not prevent the hemolytic actions of chrysotile. Polyvinylpyridine N-oxide is antihemolytic to a lesser extent and only at higher concentrations. (Author abstract modified)

61595 **APTIC NO. 80165**

Nelson, Norton

INHALATION CARCINOGENICITY OF CHEMICALS. *Preprint, International Congress of Scientists on the Human Environment, p. 154, 1975. (Presented at the International Congress of Scientists on the Human Environment, Kyoto, Japan, Nov. 17-26, 1975.)*

The carcinogenicity of inhaled chemicals has been considered in connection with occupational exposures involving inorganic chemicals, organic chemicals such as vinyl chloride and bis(chloromethyl)ether, and radioactive substances. However, daily home exposure to asbestos has been implicated in cancer, and there is also concern that vinyl chloride used as an aerosol propellant may place users in danger of cancer. These issues are reviewed with several samples, in particular the carcinogenicity of halo ethers: bis(chloromethyl)ether and methyl(chloromethyl)ether.

61596 **APTIC NO. 83373**

Nikiforowa, Jelena

LEAD IN EXHAUST GASES. HAZARDS FOR THE TROPHIC CHAIN. *(Blei im Abgas. Gefahr fuer die Nahrungskette). Text in German. Exkat. Inform. Wiss. Tech. Sowjetunion, no. 6:22-25, 1975. 4 refs.*

General problems of exhaust lead emissions and the health hazards of lead are described. Lead concentration measurements conducted in West Germany, the U. S., Switzerland, and the USSR revealed very high concentrations in soil, on and in plants near busy highways. The contamination of plants is due to direct deposition of exhaust lead particles from the air, and to uptake from contaminated soil. While the exposure to lead in air and food is usually too low to cause acute poisoning, lead accumulates in the organism, and can cause chronic poisoning, which manifests itself through such symptoms as neurological disorders, fatigability, and impairment of the reflex functions. As it is technically unfeasible to use lead-free gasoline in automobiles, the contamination due to exhaust lead should be abated by means of hedges along roads. Due to increased exposure and contamination hazards, no plants should be grown for consumption within a 100 m-belt along busy roads and highways.

61597 **APTIC NO. 82229**

Nobutomo, K. and S. Ishinishi

RELATION BETWEEN AIR POLLUTION AND RESPIRATORY IMPAIRMENT. ITS DETECTION BY CYTOLOGICAL DIAGNOSIS OF SPUTUM. *(Taikiosen to kokyukishogai, kakutan saiboshin ni yoru kenshutsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution, 10(4):496, Nov. 1975.*

Cytological diagnosis of sputum indicated the presence of respiratory impairment by air pollution that consisted of the deterioration of the self-cleaning function of the lung and the inflammation of the airway by increased amounts of sputum. The reproducibility of the method and the application to cases where cough and sputum continued in spite of a low degree of air pollution is discussed. Although no problem was found with the reproducibility, no clear relationship was seen between the cytological findings in the non-polluted area and those in Omuta and Fukuoka Cities. However, after dividing the subjects into smokers and non-smokers, differences were found in alveolar phagocytes, neutrocytes and acidocytes.

61598 **APTIC NO. 83538**

Nogami, H., H. Oda, S. Kusumoto, E. Yonekawa, Y. Tsubota, and Y. Nakajima

EFFECTS OF LONG-TERM EXPOSURE OF MICE TO NITROGEN MONOXIDE. *(Issankachisso choki bakuro no mausu ni oyobosu eikyo). Text in Japanese. Preprint, Japan Pharmaceutical Assoc., Tokyo, p. 97-99, 1975. 3 refs. (Presented at the Environment-Polluting Substances and their Toxicology Symposium, 2nd, Gifu, Japan, Oct. 27-28, 1975.)*

To study the chronic effects of long-term exposure to nitric oxide, female mice (ICR-JCL strain) were exposed continuously to nitric oxide at 10 ppm (12.3 mg/cu m), starting from four weeks old and continuing for 2 weeks and for 2, 4, and 6.5 months. The mortality of exposed mice (4/60) was almost equal to that of the control (3/60). The findings which distinguished exposed from control mice were: 1) falling and yellowing of body hairs, 2) a significant increase of the weight ratio of the kidney to the total body from the second week of exposure, and a significant increase of the weight ratio of the lungs and the spleen to the total body in the second week and after 6.5 months of exposure, 3) a significant increase of WBC from the second week, 4) a higher total bilirubin from the second week, 4) some pathological alteration in the lungs of mice exposed for more than two months, accompanied by denaturation and a proliferatic reaction of the bronchial mucosa and, stagnation in the alveolar septum accompanied by thickening and enlargement, 5) proliferation in the brochioles and mamilla, and 6) obstruction of the bronchi by mucous after 4 months of exposure.

61599 **APTIC NO. 82224**

Nukada, Y.

ANALYSIS OF INFANTILE RESPIRATORY DISEASE SYMPTOMS ACCOMPANIED BY AIR POLLUTION - ANALYSIS OF APPLICATIONS FOR OFFICIAL RECOGNIZATION OF HEALTH IMPAIRMENT. *(Taikiosen ni tomonau shoni no kokyukishikkan no shojo no bunseki - Ota-ku no kenkoshogai nintei shinseisho no bunseki). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 22(10):415, Oct. 1975.*

From 597 cases of application for official recognization of health impairment, 14 items (name of disease, area, sex, age, onset year of disease, pyrexia, cough, sputum, gasp, dyspnea, and others) and 44 categories which represent detailed content were analyzed. A classification table was constructed by and scores were obtained from 30 by 30 correlation coefficients. The score with largest range was that of the difference by medical organization, followed by the name of the disease. The most frequent symptom was wheezing, followed by continued cough, hour of cough, dyspnea and difference of age. Local differences (continued sputum, presence of pyrexia) were far less numerous. It was concluded that the scores having a large range could be significant to a degree, and that it would be dangerous to pay more attention to scores with a small range.

61600 **APTIC NO. 79715**

Ochs, Hans-Joachim

VENTILATION AND EXTRACT SYSTEM IN GALVANIC PLANTS. *(Zu- und Ablueftung in galvanischen Betrieben). Text in German. Wasser Luft Betrieb, 19(7):400-402, 1975. 7 refs.*

Engineering aspects of ventilation and extract systems for galvanic baths and toxic effects of vapors emitted from such baths are described. Recommendations for the design and dimensioning of suction hoods, complete exhaust systems, and exhaust fans are given. Exhaust hoods should have a 45 deg opening to avoid excessive turbulence. Vapors emitted from chromium baths caused nosebleed, circulatory disturbances, cardiac disorders, irritation of the respiratory tract, and lung cancer. The maximum allowable concentration of these toxic ppm for 3 hr, no change of the osmotic resistance of erythrocytes was found after 10 min of incubation; however, conspicuous (p less than 0.01) reduction of the resistance in the lower asmotic side was observed after 2 and 5 hr incubation. In the group exposed to ozone 4 times at 1 and 0.5 ppm for 3 hr and the group exposed to toluence at 900 ppm for 3 hr no change of erythrocytes was observed, and the asmotic resistance showed no change at 4 or 24 hr afer the end of exposure. The experiment was carried out according to the finding that higher surum bilirubin was frequently observed, suggesting hemolysis.

61607 APTIC NO. 79978

Oshima, Hidehiko, Masayuki Imai, and Kusuo Banno

AIR POLLUTION AND ITS HUMAN EFFECTS AT KUSU-CHO IN MIE PREFECTURE. *(Mie-ken mie-gun kusu-cho ni okeru taikiosen to sono jintai eikyo ni tsuite). Text in Japanese. Mie Igaku (J. Med. Mie Prefect. Univ.), 19(1):24-27, 1975. 8 refs.*

The effect of air pollution on human health in the Kusu-cho area, which is located in the neighborhood of the Yokkaichi petrochemical complex, was studied. Examinations were carried out on the inhabitants, including schoolchildren, and the results were compared to the data for Yokkaichi City in 1972 and 1973. The frequency of medical consultation on respiratory diseases, especially bronchial asthma, asthmatic bronchitis, chronic bronchitis, bronchitis, and pulmonary emphysema was studied, and subjective symptoms were investigated by BMRC questionnaire. The morbidity of schoolchildren for subjective symptoms such as cough, sputum, asthmatic paroxysm, and asthma, and medical histories for the past one year on bronchial asthma, asthmatic bronchitis and chronic bronchitis were considered. Although the human effects of air pollution in Kusu-cho were not so large as those in highly polluted parts of Yokkaichi City, the morbidity of upper air way diseases, common cold, bronchitis, bronchial asthma, and asthmatic bronchitis from 1965 to 1970 was significantly higher than that in a control area, and the results of the examination of inhabitants showed that the respiratory symptoms concerning chronic bronchitis, bronchial asthma, and asthmatic bronchitis have significantly increased in 1972 and 1973 as compared to the control area.

61608 APTIC NO. 79969

Oshima, S.

AIR POLLUTION AND EYE. *(Taiki osen to me). Text in Japanese. Nihon Iji Shinpo (Japan. Med. J.), no. 2625:127, Oct. 11, 1975.*

Eye-irritation was first noticed as a subjective symptom during the Tokyo photochemical smog of 1970. It was mainly diagnosed as transient conjunctivities or superficial keratitis, and only in confirmed cases of the latter should steroid be applied. The effects of photochemical smog not involving ocular organic changes include the reduction of visual acuity as much as 40% by the pollutant precursors of photochemical smog. The general conception of modified visual efficiency is described. The reduction of the transparency of the atmosphere by photochemical smog in summer presumably equals that in winter.

61609 APTIC NO. 76502

Palme, W.

ELECTROCARDIOGRAPHIC CHANGES INCIDENT TO EXOGENIC GASEOUS INTOXICATIONS. *(EKG-Veraenderungen bei exogenen gasfoermigen Intoxikationen). Text in German. Z. ges. Hyg. Ihre Grenzgebiete (Berlin), 21(8):639-641, 1975. 11 refs.*

The electrocardiograms of 249 patients were recorded after inhalation of toxic concentrations of gases. In 69 cases a complete series of preliminary and control ECGs was available. Evidence was found for tachycardias, changes in the S-T segment, A-V conduction defects, arterioventricular and bundle branch blocks, as well as estrasystoles of differing origin and auricular fibrillation due to the inhalation of irritant or toxic gases. There were no differences in the effect on the heart of the various gases tested. A correlation was found between the CO-Hb value and electrocardiographic changes due to carbon monoxide poisoning. (Author abstract)

61610 APTIC NO. 76330

Peterson, Jack E. and Richard D. Stewart

PREDICTING THE CARBOXYHEMOGLOBIN LEVELS RESULTING FROM CARBON MONOXIDE EXPOSURES. *J. Appl. Physiol., 39(4):633-638, Oct. 1975. 15 refs.*

Data from a series of human exposures to carbon monoxide were analyzed to determine the fit to the theoretical Coburn Forster Kane (CFK) equation which describes CO absorption and excretion. The equation predicts carboxyhemoglobin (HbCO) saturations for both men and women at exercise rates ranging from sedentary to 300 kpm/min when they were exposed to steady CO concentrations of 50, 100, and 200 ppm for 0.33-5.25 hr. Methods for determining values of each of the variables in the CFK equation were collected and a rational, efficient procedure for solving the equation by trial and error is outlined. The CFK equation is used to prepare a graph relating HbCO saturation to exposure duration and concentration, and also to describe the effect of several variables on the rate of CO uptake and equilibrium HbCO levels. (Author abstract modified)

61611 APTIC NO. 84236

Pilet, P. E. and M. Bejaoui

INTERACTIONS BETWEEN FLUORIDE, CALCIUM AND MAGNESIUM ON THE O2 UPTAKE BY TISSUES CULTIVATED IN VITRO. *(Interactions entre le fluor, le calcium et le magnesium sur l Absorption de l oxygene par des tissus cultives in vitro). Text in French. Biochem. Physiol. Pflanzen, 168(5/6):483-491, 1975. 30 refs.*

The combined and separate effects of calcium (++), magnesium (++), and fluorine (-) concentrations on young Rubus hispidus L. neoformations. Exposure to Ca(++) stimulated absorption of oxygen up to a .00125 M concentration of calcium chloride; Mg(++), however, was an inhibitor; the O2 absorption value remained the same for all Mg(++) concentrations used. Both Ca(++) and Mg(++) will reduce the inhibiting action of F(-) on O2 absorption. Thus, they protect the tissues against F(-) more effectively as their concentrations increase and that of F(-) decreases. When Ca(++) and Mg(++) are simultaneously present and F(-) is absent, O2 absorption is stimulated. Low concentrations of F(-) will not prevent O2 absorption from being stimulated by Ca(++) and Mg(++) together at a .00125 M concentration. This concentration, however, as well as higher concentrations will not inhibit high rates of F(-).

61612 APTIC NO. 81456

Poppers, P. J., W. Levin, and A. H. Conney

EFFECT OF 3-METHYLCHOLANTHRENE TREATMENT ON PHENACETIN O-DEALKYLATION IN SEVERAL INBRED MOUSE STRAINS. *Drug Metab. Disposition, 3(6):502-506, Nov.-Dec. 1975. 20 refs.*

The effect of 3-methylcholanthrene treatment on phenacetin O-dealkylation in several inbred mouse strains was investigated as part of an effort to determine if phenacetin metabolism can be used as an index of benzo(3-4) pyrene metabolism. The induction of benzo(3-4) pyrene hydroxylase by 3-methylcholanthrene in mice was correlated with an increase in the metabolism of phenacetin to N-acetyl-p-aminophenol. Although the magnitude of induction of phenacetin O-dealkylation was considerably less than that of benzo(3-4) pyrene hydroxylation, the metabolism of these two substrates appeared to be under similar regulatory control in mice. (Author abstract modified)

61613 **APTIC NO. 82565**

Radford, Edward P. and Myron L. Weisfeldt

FINAL REPORT OF THE STUDY OF THE RELATIONSHIP BETWEEN CARBOXYHEMOGLOBIN ON ADMISSION TO THE SUBSEQUENT HOSPITAL COURSE OF PATIENTS ADMITTED TO THE MYOCARDIAL INFARCTION RESEARCH UNIT AT THE JOHNS HOPKINS HOSPITAL. *Preprint, Johns Hopkins Univ., Baltimore, Md., School of Hygiene and Public Health and School of Medicine, 22p., 1975. 4 refs.*

The clinical course, indices of the severity of infarction, and hemodynamic changes in patients admitted with chest pain at the Johns Hopkins Hospital were evaluated in relation to smoking intensity as determined by measurements of carboxyhemoglobin and thiocyanate on admission. Smoking has been evaluated as an indication of carbon monoxide exposure because it is the principal source of such exposure in Baltimore. Patients with thiocyanate levels of less than 4.0 microgram/ml and who had never smoked were classified as nonsmokers. Those with thiocyanate levels of less than 4.0 microgram/ml and a history of greater than 20 pack/yr of cigarette smoking were classified as ex-smokers. Patients with thiocyanate levels over 4.0 microgram/ml were classified as recent smokers. Thiocyanate is a better index of smoking exposure than COHb in ill patients because unlike CO, the blood concentration is unaffected if smoking patterns change a few hr before admission. Among 140 confirmed cases of myocardial infarction recent or current smokers had larger infarcts than nonsmokers, with ex-smokers intermediate. This difference could not be explained by differences in sex, age, and race in the three groups. Hemodynamic function was relatively good in recent smokers, despite their larger infarcts, perhaps due to catecholamine release associated with smoking. These results are consistent with both an acute and chronic effect on the myocardium of long-term low-level exposures to CO, but clearly cannot be related to that factor by itself. Other constituents of cigarette smoke may be of equal or greater importance in these effects than CO. (Author abstract modified)

61614 **APTIC NO. 80315**

Reeves, R. D., K. W. Jolley, and P. D. Buckley

LEAD IN HUMAN HAIR: RELATION TO AGE, SEX AND ENVIRONMENTAL FACTORS. *Bull. Environ. Contamination Toxicol., 14(5):579-587, Nov. 1975. 15 refs.*

Environmental factors relating to the presence of lead in human hair are discussed. Workers in light industry have higher hair Pb levels than other groups. In an occupational survey, two printers had 360 and 78.1 microgram Pb/g hair. Abnormal exposure may arise from the handling of metallic Pb, or from exposure to tetraethyl Pb and the particulates resulting from its combustion in automobile engines. Dust samples collected at various locations in the city of Palmerston North over a 1-year period contained 500-1000 microgram Pb/g. The hair lead concentration was measured for 254 subjects. Levels range from 2.0-360 microgram/g. The male/female means did not differ significantly. Differences between age groups were not significant. Means for printers, mechanics, drivers, metalworkers, machinists, and related technical occupations were very significantly higher than for a second occupational group largely composed of professional workers.

61615 **APTIC NO. 83616**

Reichel, G.

AIR POLLUTION, BRONCHITIS AND EMPHYSEMA IN THE RUHR DISTRICT. *(Luftverschmutzung, Bronchitis, Emphysem: Ergebnisse im Ruhrgebiet). Text in German. Praxis Pneumol., 29(7):383-392, 1975. 60 refs.*

The causal relationship between air pollution and emphysema and bronchitis is discussed. In some persons the bronchial system is hypersensitive and reacts with bronchoconstriction to irritation of any kind, including dust. This group, which consists of 10% of the population, and the group consisting of persons with chronic bronchitis and bronchial asthma, are not entirely identical. There is considerable evidence that the incidence of bronchial disorders increases as air pollution exceeds critical, but as yet not quantified, levels.

61616 **APTIC NO. 80676**

Renes, Lucian E.

TOXICOLOGY AND PHYSIOLOGICAL EFFECTS OF PHILLIPS OIL FURNACE CARBON BLACKS. *Environmental Protection Agency, Washington, D. C., Environ. Prot. Agency Proc. Environ. Aspects Chem. Use Rubber Process. Oper., Akron, Ohio, 1975, p. 437-441. 4 refs. (March 12-14.)*

Studies investigating the toxicity and chemical composition of carbon blacks are reviewed. Medical examinations of carbon black workers with 20 or more years of exposure indicate that their overall health is superior to that of a comparable general male population. Furthermore, the overall mortality, as well as the mortality from any specific cause, is below that of a comparable population group. Toxicological experiments with animals demonstrate that a 50% lifetime or longer exposure to whole carbon blacks does not produce any malignancies or other harmful effects as a result of ingestion, skin contact, or inhalation of the whole carbon black. Chemical analyses of 10 different carbon black samples reveal that the only compound of proven experimental carcinogenicity in carbon black is benzo(3-4)pyrene. The concentration of this substance in the commercial blacks ranges from 0.8-6.7 ppm by weight.

61617 **APTIC NO. 84136**

Rivero, Octavio

AIR POLLUTION AND ITS HEALTH HAZARDS. PNEUMONOLOGICAL HAZARDS. *(Contaminacion atmosferica. Danos a la salud. Danos neumologicos). Text in Spanish. Neumol. Cir. Torax Mexico, 36(2):73-77, 1975. 10 refs.*

Evidence is given to support a cause-effect relationship between air pollution and respiratory disorders, as well as to indicate less direct ways in which the environment may play a part in the acquisition of such ailments or the aggravation of preexisting respiratory maladies. It has been verified, for example, that annual averages of sulfur dioxide concentrations of greater than 0.08 ppm with particle concentrations of more than 150 mg/cu m are related to a worsening of chronic bronchitis. Particles of 2 to 50 micron in diameter as well as gases cause paralysis of the cilia, seromucous hypersecretion, hypertrophy, and linear extension of mucous glands, and greater susceptibility to infection of the bronchial tubes. In the smallest bronchioles, particles of 0.01 to 2.0 micron and gases contribute to premature closure, metaplasia of the epithelium, and inflammation and destruction of proteolytic enzymes. In the alveoli, gases and 0.01 to 0.05 micron particles may act together to cause an increase in the number of alveolar cells and macrophages, and the release of proteolytic enzymes, thereby promoting infection. Overall, 90% of 0.5 to 3 micron particles become trapped in the respiratory tract, while those under 0.2 micron are not filtered and find their way out. Special attention is paid to outlining the natural defense mechanisms of the pulmonary tract and the ways in which naturally occurring deficiencies and pollutants can act to reduce resistance to infection. The level of current research and the need for further investigation in these areas are stressed.

61618 **APTIC NO. 84461**

Roderick, Hilliard

PROJECTED EMISSION OF SULPHUR OXIDE FROM FUEL COMBUSTION IN THE OECD AREA 1972-1985: THE INTERNATIONAL ISSUES WITH SPECIAL REFERENCE TO TRANSFRONTIER MIGRATION OF POLLUTION. *IPIECA, Petrol. Environ. Conserv. Symp. Rep., Tehran, Iran, 1975, p. 27-67. 14 refs. (April 7-9, Paper 1.)*

The effect of sulfur emissions from the combustion of fuel in stationary installations is described. The principal concern with the effects of sulfur oxides from combustion sources within a few kilometers of a small source, and to a distance of 100 km down wind from a large fossil fueled electric plant, is the possible effect on the health of people who breath the polluted air. There is a good correlation between total suspended particulate matter in the air and health effects; the correlation between SO2 and health effects is less good. There is a theoretical increase in the mortality rate of those living within the 80 km radius that varies with fuel source and degree of sulfur removal. The major long-range effect related to combustion of fuels is transfrontier pollution arising from long range non-dispersive transport of pollution.

61619 **APTIC NO. 76385**

Rosmanith, J., H. J. Einbrodt, and T. Gordon

RELATIONSHIPS BETWEEN IMMISSIONS OF PLUMB AND ZINC AND THE LEVELS OF PLUMB, ZINC AND CADMIUM IN BLOOD, URINE AND HAIR IN CHILDREN. *(Beziehungen zwischen Blei- und Zinkniederschlaegen und den Schwermetallgehalten (Pb, Zn, Cd) im Blut, Urin und in den Haaren bei Kindern). Text in German. Zentralbl. Bakteriol. Hyg., Infektionskr. Abt. Orig. B, 161(2):125-136, 1975. 57 refs.*

Children from industrial areas with a high degree of lead, zinc, and cadmium pollution were tested. The lead levels in blood and hair were found to increase with increasing atmospheric lead fall-out; the cadmium concentration in the urine increased with increasing zinc fall-out. Children from the center of town had significantly higher lead values in the blood and hair samples, and significantly lower urine lead concentrations than children living in the outskirts. The lead content of blood and hair samples corresponded to the various lead immission levels encountered in the town. The results suggest that biological cadmium interactions are influenced by simultaneous lead uptake.

61620 **APTIC NO. 84280**

Rosmanith, J.

ELIMINATION OF IRON, ZINC, SILICIC ACID AND ALUMINUM FROM THE LUNG AFTER REPEATED INTRATRACHEAL APPLICATION OF COAL DUST (ANIMAL EXPERIMENTS). *(Verlauf der Elimination aus Lunge und Leber von Eisen, Zink, Kieselsaeure und Aluminium nach wiederholter intratrachealer Kohlenstaubapplikation (Tierversuche)). Text in German. Beitr. Silikose Forsch. (Pneum, Okoniose), 27(2):47-61, 1975. 34 refs.*

Coal dust was repeatedly administered intratrachaelly to rats. The wet and the dried lung weights of exposed rats doubled in comparison to a control group. The increase of weight was the same for wet and dried samples, independent of the degree of fibrosis and of the time that the coal dust remained in the lungs. The iron elimination from the lungs of exposed rats increased with an increase in total dust deposition, aluminum elimination decreased, and zinc concentrations remained the same. Aluminum accumulated in the lungs and liver; iron accumulated in neither.

61621 **APTIC NO. 84243**

Roth, J.

BRONCHIAL OBSTRUCTION AND BRONCHIAL HYPERREACTIVITY AS A CAUSE OF DIFFICULTY IN BREATHING THAT DEPENDS ON BURDEN AND WEATHER. *(Bronchialobstruktion und bronchiale Hyperreaktivitaet als Ursache belastungs- und wetterabhaengiger Atemnot). Text in German. Z. Erkrankungen Atmungsorgane, 143(1):22-27, 1975. 37 refs.*

Bronchial obstruction and bronchial hyperreactivity were investigated in 356 male patients as a cause of difficulty in breathing that depends on burden and weather. With the increased degree of a manifest bronchial obstruction, a high significant increase in frequency of load dyspnea was demonstrated. A significant increase of difficulty in breathing that depends on weather was found only in patients with bronchial hyperreactivity.

61622 **APTIC NO. 76286**

Rummel, Rose Mary, Marilyn Crawford, and Patricia Bruce

THE PHYSIOLOGICAL EFFECTS OF INHALING EXHALED CIGARETTE SMOKE IN RELATION TO ATTITUDE OF THE NONSMOKER. *J. School Health, 45(9):524-529, Nov. 1975. 6 refs.*

Fifty-six nonsmoking college students were exposed, in a closed environment, for a period of 20 min to the exhaled cigarette smoke of two smokers. After intervals of 5, 10, 15, and 20 min of exposure, heart rates and systolic and diastolic blood pressures were monitored. Differences between times of systolic pressure was the only statistically significant finding. There was a significant difference in heart rate between groups of subjects who object (dislike) being in the presence of cigarette smoke and those who do not mind (indifferent). The dislike group had the higher rate in comparison to the indifferent group. Between times was statistically different for both groups for systolic pressure. Between group systolic pressures were not significantly different. There was no significant finding concerning diastolic changes. (Author summary modified)

61623 **APTIC NO. 80080**

Sakaguchi, K.

EFFECTS OF AIR POLLUTION ON SCHOOLCHILDREN S RESPIRATORY SYSTEM. *(Taikiosen no gakudo kokyuki no oyobosu eikyo). Text in Japanese. Preprint, Teishin Medical Society, Tokyo (Japan), p. 554, 1975. (Presented at the Teishin Medical Society Lecture Meeting, 26th, Osaka, Japan, April 2, 1975.)*

The results of a survey on the lung function of 1280 primary schoolchildren in 10 schools in rural and residential areas with different traffic and factory densities is described. After removing asthma and bronchitis patients, a clear difference in lung-function between those in areas with high air pollution and those in areas with low air pollution was found. However, it was difficult to identify the cause, and the existence of complex pollution was not confirmed. The number of asthmatic and bronchitic patients was more in air polluted areas than in non polluted areas. The difference of prognosis between patients in both areas could not be confirmed.

61624 **APTIC NO. 74735**

Sakai, Y., T. Matsutani, and T. Nakamura

RESULTS OF INVESTIGATION OF SUBJECTIVE SYMPTOMS CONCERNING AIR POLLUTION. PART 1. ESPECIALLY, ON THE EFFECTS OF PHOTOCHEMICAL SMOG ON PERSONNEL IN NAKANO TELEGRAM OFFICE. *(Taikiosen ni kansuru hikakushojo chosa (1) tokuni Nakano Dempo Kyokuin o chushin to site). Text in Japanese. Teishi Igaku (Med. J. Communication), 27(7):409-419, July 1975. 4 refs.*

During 2 mo of July and August 1973, subjective symptoms of irritation in eyes, throat, and nose, and abnormal sensation on the chest of 40 employees at Nakano Telegram Office were surveyed each day. More than two persons claimed such symptoms for 7 days during 2 mo. On those days, the oxidant concentration at a monitoring point at the Nakano Ward Office was more than 13 pphm. There were 20 days during the 2-month period when the oxidant concentration was more than 13 pphm. Other factors such as sulfur and nitrogen oxides, ambient temperature, relative humidity, and the presence or absence of wind showed no correlation with the symptoms. Among the 40 employees eight persons complained of symptoms. Symptoms appeared on days when the oxidant concentration reached 15 pphm.

61625 **APTIC NO. 80055**

Sakai, Y., T. Nakamura, and T. Matsutani

RESULTS OF SUBJECTIVE SYMPTOMS SURVEY DUE TO AIR POLLUTION, ESPECIALLY ON OCULAR SYMPTOMS. *(Taikiosen ni kansuru jikakushojo chosa, tokuni ganshojo ni tsuite). Text in Japanese. Teishin Igaku (Med. J. Communication), 27(8):485-491, Aug. 1975. 3 refs.*

A survey of ocular and respiratory symptoms of 817 Tokyo employees of the Telegraph and Telephone Corporation (mainly those engaging in outdoor duties) showed that 31% of them experienced ocular symptoms, mainly in summer, without any local difference (from Oct. 2 to Dec. 4, 1972). A significantly higher morbidity of ocular symptoms was recognized in those having chronic respiratory diseases; however, there was no fixed relationship between the morbidity and the observed value of oxidant concentration. The subjects were between age 40 and 59.

61626 **APTIC NO. 79977**

Satake, T.

AIR POLLUTION AND RESPIRATORY DISEASES: OVERCOMING THE PROBLEMS OF MEDICAL TREATMENT AND ADMINISTRATION. *(Taikiosen to kokyuki shikkan, iryo to gyosei no mondaiten o dakaisuru tameni). Text in Japanese. Nippon Kyobu Rinsho (Japan. J. Chest Diseases), 13(9):501-502, 1975.*

Some major problems of air pollution and respiratory diseases concerning medical treatment and administration are described. The cause of chronic bronchitis, in terms of nitrogen oxides and oxidants, is described. At present, pollution due to sulfur dioxide from stationary sources has decreased. The morbidity of chronic bronchitis which has been lower in Japan than in England, and morbidity of bronchial asthma in the Yokkaichi-Shiotsu area (5% already in 1965) are reviewed. The official designation of environmentally polluted areas is discussed. The difference between the number of actual patients and the number of officially recognized patients, which shows that compensation programs are only applied to a limited number of the actual patients, is discussed. The occurrence of asthmatic bronchitis must be defined by clinical and fundamental studies. The establishment of examination centers in polluted areas and rehabilitation centers in non-polluted areas, finding appropriate jobs for recovered patients, and implementation of methods to control nitrogen oxides and oxidants which have not been considered in the official designation of polluted areas are recommended.

61627 **APTIC NO. 82751**

Sawicki, E.

THE CHEMICAL COMPOSITION AND POTENTIAL GENOTOXIC ASPECTS OF POLLUTED ATMOSPHERES. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Sampling and Analysis Methods Branch, 199p., 1975. 651 refs. (Presented at the Workshop for the Investigations on the Carcinogenic Burden by Air Pollution in Man, Hanover, West Germany, Oct. 22-24, 1975.)*

The composition of the atmosphere is reviewed in terms of background, urban, and highly polluted levels which in turn are related to potential genotoxic effects on humans. Atmospheric pollutants discussed include: nitrogen oxides, olefins, sulfur dioxide, ozone, formaldehyde, halogenated hydrocarbons, expoxides, phenols, peroxyacetyl nitrate, hydrocarbons, nitrosamines and precursors, chloroalkyl ethers, para-dioxane and aza arenes, sulfates, aromatic amines, sulfites, carcinogens and cocarcinogens, and asbestos. Evidence is presented indicating that carcinogenesis and mutagenesis in human beings involves much more than the attack of a primary genotoxicant. Genetic factors, cofactors, and sometimes pretoxicants can also play important roles in the process of genotoxicity.

61628 **APTIC NO. 80318**

Scharf, Steven M., Solbert Permutt, and Baruch Bromberger-Barnea

EFFECTS OF HYPOXIC AND CO HYPOXIA ON ISOLATED HEARTS. *J. Appl. Physiol., 39(5):752-758, Nov. 1975. 31 refs.*

The effects of hypoxic and carbon monoxide hypoxia on isolated perfused dog hearts was investigated. The hearts were made hypoxic by respiring the support dog with low oxygen (hypoxic hypoxia) or with carbon monoxide (CO hypoxia). Each heart was exposed to both types of hypoxia, separately. As oxygen content (CaO2) was lowered from 20 to 5% vol%, coronary flow (Qt) doubled with hypoxic hypoxia and almost tripled with CO hypoxia. Cardiac oxygen consumption (VO2) AND CONTRACTILITY increased with both types of hypoxia. Beta adrenergic blockade eliminated the increase in VO2 and contractility but not the difference in Qt increase between hypoxic and CO hypoxia. At constant Qt, vascular resistance decreased more with CO than hypoxic hypoxia. Alpha blockade eliminated the differences in vascular resistance and thus with complete (alpha and beta) blockage, the two types of hypoxia had the same effect and were indistinguishable. (Author abstract modified)

61629 **APTIC NO. 80078**

Schellmann, B. and A. Zober

NORMAL VALUES OF FLUORIDE FROM A DEFINED REGION OF THE HUMAN ILIAC CREST. *Int. Arch. Occup. Environ. Health, 35(3): 233-244, 1975. 32 refs.*

Normal fluoride concentrations in the human iliac crest were determined by analysis of bone ash from 100 cadavers of both sexes. The bone samples were taken from exactly the same skeletal location to allow for direct comparison with samples derived by bioptical methods from living subjects. The analysis was carried out on samples of dried bone ash with an ion sensitive electrode. Statistical analysis of the results indicates a positive linear relationship between fluoride content and age.

61630 **APTIC NO. 76387**

Schmidt, P., D. Burck, and R. Gohlke

ANIMAL EXPERIMENTAL STUDIES ON THE TOXICITY OF BARIUM STEARATE. *(Tierexperimentelle Untersuchungen zur Toxizitaet des Bariumstearats). Text in German. Z. ges. Hyg. Ihre Grenzgebiete (Berlin), 21(8):613-617, 1975. 9 refs.*

The toxic effect of barium stearate is low on single oral administration (rats, LD subscript 50, 3400 mg/kg; mice, LD subscript 50, about 1.81 mg/kg) and inhalation (rats, 2-hour respiration with 1.81 mg/l; no deaths). A 4-week cutaneous application to rats, guinea pigs, and rabbits resulted in no recognizable signs of poisoning. Subchronic oral application to rats produced some changes in the blood, the liver, and the kidneys. The value of maximum local concentration for this compound should not exceed 3 mg/cu m.

61631 **APTIC NO. 83541**

Serizawa, S.

AIR POLLUTION AND SYMPTOMS OF COLD IN CHILDREN. PART 3. *(Taikiosen to kodomo no kaze shojo). Text in Japanese. Min-I-Ren Iryo (J. All-Jap. Leagues Democr. Med. Inst.), no. 43:8-9, 1975.*

A survey was carried out to trace the health of children (3 years after a first survey), comparing the health of children in Osaka Prefecture, Fukuoka City, and Yanagawa City, and to discover the morbidity of symptoms of cold in children in Osaka Prefecture. For children older than 4 years, a significantly larger frequency of coughing was found in Osaka than in Yanagawa, and a significantly larger frequency of stridor was found in Osaka than in Fukuoka and Yanagawa. In Osaka, those born in 1974 were likely to catch cold, and those born in 1972 and 1973 were likely to catch cold with high temperature. When children were classified as to severity of symptoms, according to the frequency of catching cold, it was found that the effects of air pollution continued for 2 and 3 years.

61632 **APTIC NO. 84693**

Seto, H.

EFFECTS OF OZONE ON FLUID IMMUNOLOGICAL MECHANISM. *(Ozone ni yoru ekisei meneki kek[illegible] no eikyo). Text in Japanese. In: Report on the Results of Studies on Environmental Pollution II. Tokyo Metropolitan Public Health Research Lab. (Japan), p. 18-19, July 1975.*

The cause of increase of susceptibility to respiratory infection resulting from exposure to photochemical smog (of which ozone is the major component) was studied from the aspect of antibody formation. Male ICR mice of age 6 wk were immunized with sheep erythrocytes (400 million cells) and were exposed to ozone at 0.5 and 2 ppm, respectively, for 1 hr, after 24 hr of immunization. They were then sacrificed and the number of antibody producing spleen cells was determined. The number was compared to that of mice exposed to ozone at 2 ppm for 1 hr before and after inoculation on the 4th day of immunization. The weight of control spleen was greatest 4 days after immunization; however, that of mice exposed to ozone 24 hr after immunization did not show any increase irrespective of ozone concentration. The number of IgM (immunoglobulin M) antibody producing cells peaked after 4 days of immunization in controls (497,000 + or - 167,000); however, that of mice exposed to ozone was conspicuiously inhibited (126,000 + or - 58,000). The effect of the time of ozone exposure was that while no effect of ozone appeared when mice were exposed to ozone 24 hr before inoculation, exposure to ozone after 1 and 24 hr of inoculation inhibited the production of antibody.

61633 **APTIC NO. 83720**

Seto, K., M. Kon, M. Kawakami, T. Sugita, M. Shishido, and T. Takahashi.

EFFECTS OF THE INHALED GASEOUS MIXTURE OF NITROGEN DIOXIDE AND OZONE ON THE FORMATION OF PHOSPHOLIPID IN THE LUNG. *(Haino rinshishitsu seisei ni taisuru NO 2 oyobi O 3 no kongo kitai kyunyu no eikyo). Text in Japanese. Igaku to Seibutsugaku, 91(3):143-146, 1975. 2 refs.*

Rabbits were exposed by inhalation of nitrogen dioxide, ozone, and a gaseous mixture of nitrogen dioxide and ozone. Their lungs were sliced, and the uptake of 14 carbon from 14C-1-acetic acid into several fractions of phospholipid was determined. Inhalation of nitrogen dioxide or ozone alone for 1 hr at 0.15 ppm did not affect the intake of 14C into the phospholipids; however, inhalation of a gaseous mixture of nitrogen dioxide and ozone each at 0.15 ppm for 1 hr reduced the intake of 14C into lecithin. Continued inhalation of the gaseous mixture for 1 wk reduced the intake of 14C into lecithin and phosphatidyl ethanolamine, although single inhalation of either component at 0.15 ppm for 1 wk did not affect the intake of 14C into sphingomyelin, lecithin, phosphatidyl inositol, or phosphatidyl serine. Inhalation of either component at 0.50 ppm for 1 hr did not affect the intake of 14C into sphingomyelin, phosphatidyl inositol, phosphatidyl serine, or phosphatidyl ethanolamine; however, inhalation of the gaseous mixture at 50 ppm for 1 hr reduced the intake of 14C into sphingomyelin and lecithin. Continued inhalation of the gaseous mixture at 0.50 ppm for 1 wk conspicuously reduced the intake of 14C into lecithin, sphingomyelin, phosphatidyl inositol, phosphatidyl serine, and phosphatidyl ethanolamine.

61634 **APTIC NO. 76534**

Severs, Richard K.

AIR POLLUTION AND HEALTH. *Texas Rep. Biol. Med., 33(1):45-83, 1975. 125 refs.*

The effects of air pollution on human health are reviewed. Data from toxicology, epidemiology, clinical, and laboratory exposures are presented as a basis for an emerging etiology. Sulfur dioxide, suspended particulates, nitrogen dioxide, photochemical oxidants, and carbon monoxide are examined as stress agents to the cardio-pulmonary system. (Author abstract)

61635 **APTIC NO. 83230**

Shandala, M. G. and Y. I. Zvinyatskovskiy

CERTAIN METHODICAL MEANS OF STUDYING THE COMPLEX EFFECT OF THE ENVIRONMENT OF SETTLEMENTS ON THE HEALTH OF THE POPULATION. *(Nekotorye metodicheskie podkhody k izucheniyu kompleksnogo vliyaniya vneshney sredy naselennykh mest na zdorov e naseleniya). Text in Russian. Gigiena i Sanit., vol. 11:5-10, 1975. 18 refs.*

Studies on the nature and degree of the influence of the most expressed factors of the external environment in populated settings and their effect upon the health of the population are reported. Certain factors of different origin and character, when acting together, can itensify the negative effect of each one of them. Many population centers have a series of such negative aggregates of factors, each effecting a group of diseases. Even with a weakly expressed dependence of the morbidity level on several individual factors, the degree of this dependence significantly intensifies with this negative aggregate of factors. Measures undertaken in the Soviet Union will purify the atmosphere substantially, but complete elimination of noxious substances is practically impossible. Therefore, the elimination of the stratification of factors harmful to human health is vital.

61636 **APTIC NO. 76488**

Shettigara, Parkala T.

ASBESTOS, SMOKING, AND LARYNGEAL CARCINOMA. *Arch. Environ. Health, 30(10):517-519, Oct. 1975. 21 refs.*

The relationship between exposure to asbestos and laryngeal cancer was investigated in a retrospective study of 43 pairs of patients with laryngeal cancer and their matched controls. A number of variables were investigated including smoking, exposure to asbestos, and other occupational factors. There is a substantial association between asbestos exposure and laryngeal cancer. Cigarette smoking is associated with the disease, although the strength of association is not as high as that for asbestos. Exposure to uranium, chromium, nickel, cobalt, arsenic, X-rays, and alcohol is not related to later development of carcinoma of the larynx. Exposure to asbestos and cigarette smoking are potent factors in the development of this disease. (Author abstract modified)

61637 **APTIC NO. 82251**

Shimizu, T.

CHRONIC PULMONARY DISEASES IN HOSPITAL PART 2. ON BRONCHIAL ASTHAMA. *(Toin deno manseikokyuki shikkan no sogoteki kanri 2. Kikanshi-zensoku ni tsuite). Text in Japanese. Min-I-Ren Iryo (J. All-Jap. League Democr. Med. Inst.), no. 43:21-23, 1975.*

Results of allergen tests and the effects of non-specific stimulation are reported on patients with bronchial asthma. The percentages of positive reactions were found for several allergens in intra-cutaneous test: 77% for candida, 75% for bronchoasthma liquid, and 23% for house dust followed by silk, eumycetes, and common ragweed. A further test of multipositivity is described in detail. The effects of non-specific stimulation such as excessive exercise in cold air followed by inhalation of smoke are described, and the author concludes that bathing in warm water and light exercise have no harmful effect on sensitivity to allergens.

61638 **APTIC NO. 80158**

Shishido, M., T. Sugita, F. Higuchi, A. Ogiwara, and H. Murabayashi

RELATIONSHIP BETWEEN THE MORBIDITIES OF RESPIRATORY SYMPTOMS AND RESPIRATORY FUNCTION IN POLICEMEN. *(Keisatsukan no kokyuki shojo yushoritsu to kokyukino tono kankei). Text in Japanese. Taiki osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):501, Nov. 1975.*

The relationship between the morbidity rate of respiratory symptoms and the presence of respiratory function impairment was studied by interviewing policemen in Kanagawa Prefecture, using the BMRC method. The 583 policemen on patrol car, 113 motorcycle policemen, and 41 policemen in dual duties were examined during Jan.-Feb. 1974. The results were: (1) there was no significant difference between the respiratory function (by symptom) in ages younger than 39 and older than 40, (2) there was no significant difference between smokers and nonsmokers for the correlation studied, and (3) there was no relationship between the morbidity of respiratory symptoms and respiratory function; it was suggested, however, that V(50) showed the lowest value in persons who complained of dyspnea.

61639 **APTIC NO. 84019**

Shugla, T. M.

THE EFFECT OF CARBON MONOXIDE ON ALBINO RATS WITH A THYROIGENIC REACTION. *Gigiena i Sanit. Text in Russian. p. 10-14, 1975. 10 refs.*

The effect of carbon monoxide on albino rats treated with a thyroigenic reaction was investigated. Rats exposed to CO at concentrations of 1.78 mg/cu m exhibited changes in the chronaxy of muscles antagonisis. There was a decrease in blood reticulocytes, blood serum iron, and oxygen consumption. Carbon monoxide at a concentration of 2.65 mg/cu m produced in healthy animals only certain changes of the porphyrine metabolism and a reduction of the number of reticulocytes.

61640 **APTIC NO. 76605**

Sidorenko, G. I.

METHODOLOGY OF THE HYGIENIC EVALUATION OF COMBINED AND COMPLEX EFFECTS OF ENVIRONMENTAL FACTORS. *(Methodologie der hygienischen Bewertung der kombinierten und komplexen Wirkung von Umweltfaktoren). Text in German. Z. ges. Hyg. Ihre Grenzgebiete (Berlin), 21(10):721-726, 1975.*

The bases for establishing uniform hygienic standards that take into consideration both the combined and the complex effects and sources of atmospheric chemical pollutants are described. Substances with different toxic mechanisms may be encountered simultaneously in the environment, and may exert a combined or synergistic effect. There may be complex sources of exposure to a single pollutant (e.g., simultaneous exposure to the same substance in air, food, and water).

61641 **APTIC NO. 83583**

Siemon, Gerhard

AIR POLLUTION AND THE LUNGS: PRESENT AND FUTURE RISKS. *(Lunge und Umweltverschmutzung: Welche Art von Stoerungen sind zu erwarten). Text in German. Praxis Pneumol., 29(7):376-382, July 1975. 16 refs.*

The effects of air pollution on the lungs are discussed. The bronchi, bronchioles, and alveoli react differently to pollution. The body s defense mechanism may or may not be able to resist the pollution agent. Failure of the defense system causes reversible or irreversible functional and/or morphological lung changes. Assessment of the causal role of a particular agent is difficult because of the additive and syngergistic effects if several noxae are involved. These factors cannot be adequately separated and assessed in animal experiments, and the problem required investigation by epidemiological studies.

61642 **APTIC NO. 83521**

Smulevich, V. B. and G. S. Livshitz

CHRONIC DISEASES OF THE LARYNX IN CHAUFFEURS OF THE CITY TRANSPORT. *Text in Russian. Vesluik Obalaringologii, no. 2:75-76, 1975. 14 refs.*

The incidence of chronic diseases and neoplasms of the larynx was investigated in 300 city transport drivers over a 5-year period. There was an increase in the incidence of chronic laryngitis among workers with longer work records. The incidence of laryngeal carcinoma was greater than among the male population of Moscow. Among the causes of invalidation of drivers, carcinoma of the larynx ranked third, after carcinoma of the stomach and lungs. The main cause of chronic larynx disease was contact with air polluted by the products of combustion and oil.

61643 **APTIC NO. 83889**

Stell, P. M. Stell and T. McGill

EXPOSURE TO ASBESTOS AND LARYNGEAL CARCINOMA. *J. Laryngol. Otol., 89(5):513-517, 1975. 4 refs.*

A total of 119 male patients with squamous carcinoma of the larynx and 119 matched controls with various non-malignant diseases were questioned about their exposure to asbestos. A total of 33 patients and three controls had exposure to asbestos. The difference between the two groups was statistically highly significant. There were three types of occupational exposure: lagging of heating equipment (920 patients); scaling of boilers (three patients); and unloading raw asbestos on the docks (10 patients). There was no difference in the smoking habits of patients who were asbestos workers compared to those patients who had no association with asbestos. There was a greater percentage of non-smokers among the control compared with those patients who had laryngeal carcinoma. (Author summary modified)

61644 **APTIC NO. 80202**

Stewart, Richard D.

THE EFFECT OF CARBON MONOXIDE ON HUMANS. *Ann. Rev. Pharmacol., vol. 15:409-423, 1975. 50 refs.*

The effects of carbon monoxide on humans are evaluated with emphasis on those exposure situations that result in blood saturation of carboxyhemoglobin (COHb) below 18%. Exposure to CO in excess of that permitted by the quality standards of the Clean Air Act of 1971 is widespread and occurs regularly. A total of 45% of the nonsmoking blood donors in 18 sections of the country, each one of which includes metropolitan and rural areas, have COHb saturations greater than 1.5%. The decision not to enforce the air quality standards, but to relax the standards because of the national energy crisis places the health of some people in jeopardy. The primary effect of CO on humans results from the anoxic stress secondary to the reduction in the oxygen carrying capacity of blood. Healthy humans are exquisitely sensitive to any anoxic stress, immediately compensating by increasing cardiac output and flow to critical organs. Humans with significant cardiovascular disease are not able to compensate adequately and are rendered more vulnerable to the toxic effect of CO.

61645 **APTIC NO. 79682**

Stoefen, D.

DOES LEAD CONTRIBUTE TO THE PATHOGENESIS OF SPINE DISEASES? *(Spielt Blei eine Rolle in der pathogenese der Wirbelsaeulenleiden)? Text in German. Z. Orthop. Ihre Grenzgeb., 113(1):59-67, 1975. 69 refs.*

The contribution of lead to the pathogenesis of spine diseases is discussed. Statistical data of a public insurance office in West Germany show a drastic increase of carriage impairments in juveniles. A plausible explanation of this phenomenon is presented by the Pb quantities in auto exhaust. Present levels of environmental Pb produce a measurable biochemical alteration in the population of industrialized countries (inhibition of the activity of the enzyme aminolevulinic dehydrogenase). By disturbing the synthesis of nucleic acids and proteins, Pb impairs the fundamental processes of life. Epidemiological and biochemical evidence for an influence of Pb on the vertebral column and its diseases are discussed.

61646 **APTIC NO. 83414**

Strong, Arthur A., Robert Penley, and John H. Knelson

DESCRIPTION OF A HUMAN EXPOSURE SYSTEM FOR CONTROLLED OZONE ATMOSPHERES. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Clinical Studies Div., 27p., 1975 (?). 8 refs.*

A human exposure system which permits the introduction and control of ozone into an acrylic plastic chamber in which a human subject actively resides is described. Ozone is introduced into the chamber air intake and is controlled by an electro-mechanical feedback system operating from the electrical output of an ozone gas analyzer. A continuous record of ozone concentration, temperature, and dew point is provided by an analog multipoint strip chart recorder. When the chamber ozone levels exceed preset limits, an alarm system is activated which automatically stops the ozone flow and switches the chamber exhaust to purge operation. A complete air exchange occurs every 72 sec. In an emergency, the chamber can be purged in 190 sec. Chamber temperature and humidity are dependent on conditioned laboratory air. (Author abstract modified)

61647 **APTIC NO. 80096**

Stupfel, Maurice, Madeleine Mordelet-Dambrine, and Jean-Louis Parrot

THE ACUTE ACTIONS OF AUTOMOTIVE EXHAUST GAS AND ITS COMPONENTS ON GUINEA PIG TRACHEAL PRESSURE. *Toxicol. Appl. Pharmacol., 33(3):401-413, Sept. 1975. 36 refs.*

The effects of dilutions of automotive exhaust gas and carbon monoxide, carbon dioxide, nitrogen oxides, and reduced oxygen on the tracheal and carotid pressures of anesthetized, artificially ventilated guinea pigs were studied. Bronchospasms were obtained with CO and with hypoxic mixtures. Increases and decreases of tracheal pressure were observed with dilutions of oxides of nitrogen and of carbon dioxide, respectively. Muscular contractions, which were suppressed by intravenous injections of succinylcholine, were provoked mostly by inhalation of CO2 mixtures. The delay of the appearance of these changes in tracheal pressure diminished as the concentrations of the inhaled air pollutants increased. Dilution of automotive exhaust gas provoked tracheal pressure changes which can be compared to those obtained with dilutions of carbon dioxide. (Author abstract modified)

61648 **APTIC NO. 79796**

Sukeda, Y., E. Mikami, Y. Sato, and T. Yamamoto

ON THE DYNAMIC STATE OF IONS AND THE RELATING ENZYME ACTIVITY IN FLUORINE-POISONED RATS. *(Fusso-chudoku rat ni okeru ion-dotai to sono kanken koso kassei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):516, Nov. 1975.*

The effects of airborne fluorides deposited on pastures and taken by domesticated animals is of interest. Sodium fluoride was p.o. administered to male Wister rats at a rate of 2.3 mg fluorine/100 g body weight, and the effects were observed. The concentration of fluoride ion in the blood reached its maximum, 2.2 ppm, after 30 min of administration, then decreased slowly to 0.2 ppm after 15 hours. Urinary fluoride was highest during the first day of tests, with a conspicuous increase of urinary phosphate ion. Magnesium ion showed a small increase and calcium ion showed a small decrease in the urine. Serum alkaline phosphatase activity showed an increase; however, acidic phosphatase activity and renal-alkaline and renal-acidic phosphatase activity showed a decrease. The ATPase in renal cortex activity increase with administration of sodium fluoride and sodium chloride, compared to the control group. However, the activity in rats administered sodium fluoride was inhibited when compared to that in rats administered sodium chloride.

61649 **APTIC NO. 82259**

Sukegawa, N., K. Saruta, K. Imabashi, M. Shishido, T. Sugita, F. Higuchi, A. Ogihara, and H. Murabayashi

REPORT OF THE RESULTS OF RESPIRATORY SYMPTOM INVESTIGATION OF THE INHABITANTS OF YOKOHAMA CITY - EXAMINATION BY BMRC METHOD PART 1. *(Yokohama shi-iki ni okeru jumin no kokyuki-shojo chosa kokoku - BMRC hoshiki ni yoru kento Part 1). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 22(10):404, Oct. 1975. 1 ref.*

In Yokohama City, air pollution due to sulfur dioxide is becoming less, but nitrogen oxides are increasing in part of the coastal area. The morbidity due to respiratory symptoms was surveyed for 1273 citizens in the whole city by the BMRC method. Randomly selected citizens between ages 40 and 60 who had lived more than 3 years in the city were checked for lung function, blood pressure, chest roentgenography, body-weight and height. Continuous cough and sputum were reported for 6% of men and 2.4% of women (3.4% of nonsmoking men and 6.9% of smoking men). Chronic bronchitious symptoms were found in 1.4% of men and 0.3% of women. The one-second rate was 82.3 in men and 8.35 in women. When these results were compared to those found in 1972, there was no large difference. The standard for designating an area as polluted by sulfur dioxide was not exceeded in coastal Yokohama (the Tsurumi area), with an 0.023 ppm yearly average; however, nitrogen dioxide in air is 0.043 ppm yearly average, suggesting the necessity for considering not only sulfur dioxide but also nitrogen dioxide and other pollutants.

61650 **APTIC NO. 79798**

Suzuki, T., M. Umeda, S. Nakazawa, H. Goto, and S. Nagaoka

EFFECTS OF OZONE EXPOSURE ON ANIMAL S BLOOD. *(Ozone bakuro no ketsueki ni taisuru eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):472, Nov. 1975.*

Dutch rabbits (age 7 month) are continuously exposed to ozone at 1 + or - 0.2 ppm for 10 days, and their blood was sampled every day during exposure from an auricular vein and hematologically examined. Although some variations of RBC, hematocrit value, mean red cell volume, total protein, and albumin were seen daily they were not significant. While blood cell count increased significantly at the 10th day. Hemoglobin, MCH, MCHC, glucose and GPT activity were higher than in the control group during and after the exposure. Activity of GOT and LDH showed significant increase at 6th day, then returned to the control value after exposure. The SH-group reduction during the exposure was not recovered after exposure. The ALP activity declined significantly at the 6th day of exposure.

61651 **APTIC NO. 79792**

Takemoto, K., H. Kawai, and T. Endo

EFFECTS OF AIR POLLUTION ON THE RESPIRATORY SYSTEM PART 6. THE DEGREE OF POLLUTION OF DOGS LUNGS BY LOCALITY AND AGE, AND LUNG CANCER. *(Taikiosen no kokyuki ni oyobosu eikyo, Inuhai no chiiki nenrei-betsu hai osendo to haigan). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):509, Nov. 1975.*

Pathohistological studies were carried out on respiratory diseases in the lungs of dogs and pigeons. The study of dog lungs in Tokyo yielded: 49 cases of highly polluted lungs, frequently observed for ages older than 3; 33 moderate cases found between 2o6 years old; 33 light cases in ages younger than 2. Two cases of tumoral proliferation were found with each squamous and adenomatous case, malignant lung tumor was found in one case, and proliferous changes were found in 9 cases, of which 8 cases were in aged dogs found in highly polluted areas. In Seoul, highly, moderately, and slightly polluted cases numbered 33, 95, and 129, respectively. In Korea in industrially polluted areas lung cancer in dogs was found. As in human cancer of the lung, the carcinogenesis in dogs lung develops from equitopical proliferation of bronchial alveolar epithelium via heterotopic adenomatous and squamous proliferation to tumoral development resulting in tumorigenese and carcinogenesis.

61652 **APTIC NO. 79793**

Takemoto, K., H. Kawai, and T. Endor

EFFECTS OF AIR POLLUTION ON THE RESPIRATORY SYSTEM PART 5 RELATION BETWEEN THE DEGREE OF LUNG-POLLUTION AND METAL CONTENTS OF TISSUES IN DOGS AND PIGEONS. *(Taikiosen no kokyuki ni oyobosu eikyo, Part 5. Inu, hato hai no hai-osendo to kinzokuryo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):508, Nov. 1975.*

The presence of 13 kinds of metals in dog and pigeon lungs was considered in terms of locality and the degree of ambient pollution in Tokyo and Seoul (dogs) and Tokyo, Kawasaki, Yokohama, Gumma and Seoul (pigeons). The highly polluted dog lungs were most frequently found in Tokyo, the highly polluted pigeon lungs were most frequently found in Ueno (a commercial area in Tokyo) and in Yokohama and Kawasaki (industrial zones). Slightly polluted lungs were found mainly in Gumma and Seoul where air pollution is slight. The air content of chromium, nickel and lead was high in Tokyo; the concentrations of Cr and Ni reflect the degree of lung pollution by these elements. The lung content of Cr and Ni became higher with increased age; in the pigeon lungs, a local difference was clear for copper, cadmium, Ni and Cr. The lungs of dogs are free from smoking habit and pollutants due to occupation, and the respiratory system of pigeons is weak at collecting dusts. These facts suggest that the two animals are excellent as dust indicators.

61653 **APTIC NO. 83971**

Takemoto, K., H. Katayama, H. Yoshimura, H. Kawai, K. Namie, and C. Imagawa

STUDIES ON THE CHANGE IN PNEUMONOPATHY BY AIR POLLUTION AND AMOUNTS OF EACH METAL. *(Taikiosen ni yoru haibyohen to kakukonzokuryo no kenkyu). Text in Japanese. Preprint, Japanese Society of Lung Cancer, Tokyo, p. 229, Oct. 1975. (Presented at the Japanese Society of Lung Cancer Meeting, 16th, Osaka, Sept. 30-Oct. 2, 1975.)*

Results of comparative studies of regional differences in the content of metals in the lungs of dogs and the presence of tumors are given. Pathological studies since 1974 using 111 dogs in Tokyo and 552 dogs in Korea revealed that 44% of the Tokyo dogs and 3.5% of the Korean dogs were contaminated at levels more than the average, and that this contamination increased with the age of the dog. In 15.3% of the Tokyo dogs and 0.4% of the Seoul dogs there was evidence of metaplastic proliferation, most of which was found in highly contaminated animals. Lung cancer was found in only one Tokyo dog, and of 359 dogs other than those in Seoul, there were only 2 contaminated lungs, and no metaplastic changes. The metal contents of the lung of 46 Tokyo dogs and 74 Seoul dogs were compared. Chromium, nickel, lead, iron, copper, magnesium, zinc, cadmium, and cobalt were significantly higher in Tokyo. Nickel and chromium in lungs were especially well correlated with respective levels in the two cities, indicating that lung concentrations may be due to stationary sources such as factories, rather than mobile sources such as automobiles.

61654 **APTIC NO. 79619**

Takizawa, Y. and I. Nakamura

EFFECTS OF CALCIUM FLUORIDE ON RESPIRATORY SYSTEM. *(CaF no kokyuki-kei ni oyobosu eikyo). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 22(10):400, Oct. 1975.*

Wistar adult female rats were exposed to calcium fluoride dust at 27(?)/cu m, 4 hr/day for 10 and 30 days. Rats were sacrificed 24 hours after the last exposure of each day. The findings were: (1) fluorine in exposed rat s urine increased to 2.3 times as high as in the control group after 15 days of exposure, (2) fluorine in the rat s serum became about 2.5 times as high as the control; however, this was not dependent on length of exposure, suggesting a small accumulation of fluorine in serum, (3) fluorine in the lung was notably higher, followed by spleen, liver, heart and kidney in the order, (4) fluorine in femurs and incisors tended to increase with exposure, histologically, in rats exposed for 10 days (5) edema in bronchiolar mucous epithelium and intramucosal epithelium, infiltration of neutrocytes, appearance of plasmocytes in the mucosal proper layer, smoothing of mucosal epithelium, filling of the alveolar epithelium, and fall-out of alveolar epithelium and phagocytes into the alveolar cavity were observed, in rats exposed for 30 days, (6) disappearance of the edema and the filtration, increase of appearance of plasmocytes and of smoothing of the mucosal epithelium, swelling of the alveolar epithelium, increase of fall-out of alveolar epithelium and phagocytes into the alveolar cavity, stagnation of acidphile substances in the alveoli, agglomeration of plasmocytes around small vessels, and increase of cells on alveolar septa without fibrous thickening and glassy membrane were also observed.

61655 **APTIC NO. 80065**

Takizawa, Y.

FLUORIDE POLLUTION IN JOETSU AREA AND ITS HUMAN EFFECT. *(Joetsu-chiho no fukkabutsu to jintai-eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):215-221, Nov. 1975.*

Because of conspicuous damage to vegetables grown around the Naoetsu Factory of Shinetsu Chemical Industries due to fluorine compounds in the exhaust of the factory, the inhabitants (1152 adults older than 40 and 1147 children between ages 3 and 15) who live within 1 km of the factory were medically examined during 4 years beginnings in 1970. The average fluoride ion content of the urine of the inhabitants was significantly higher than that of a control group (0.885 vs. 0.574 ppm in adults and 0.391 vs. 0.180 ppm in children. The morbidity of macular teet was significantly higher in the affected area. The morbidity of carious permanent teeth was less in the studied group than in the control. Roentgenography of the study group s bones showed a 19.3% rate of abnormality in younger inhabitants. More frequent occurrence of chronic bronchitis was found in the study group. The frequency of occurrence of diffuse density in the lung was significantly higher in the study group. These findings indicated that there is significant pollution due to fluorides, especially in air.

61656 **APTIC NO. 79998**

Tanaka, Akira, Takeshi Mori, Taizo Nakamura, and Takeko Usuda

RESULT OF THE SURVEY OF ASTHMA ON SCHOOLCHILDREN IN SAITAMA PREFECTURE. PART 1. FREQUENCY OF ASTHMATIC OCCURRENCE SEEN BY AREA. *(Saitama-ken ni okeru shochugakusei no zensoku chosa. Part 1. Chiiki betsu ni mita hasseihindo). Text in Japanese. Shoni Hoken Kenkyu (J. Child Health), 34(3):134-136, Sept. 1975. 10 refs.*

The frequency of occurrence of asthma in the Warabi industrial area in Saitama Prefecture neighboring Tokyo was compared to that in the Fukaya and Okabe areas in the northern part of the Prefecture. The degree of air pollution in the former area, represented by sulfur oxides, floating dust, and dust-fall, was about twice that in the latter two areas in 1971. There were 8831 subjects in the former area and 11,245 in the latter areas, all primary and middle schoolchildren. The survey was carried out using two questionnaires, medical histories, and chest percussion. The frequency of occurrence of asthma in the Warabi area was 3.14%; in the latter two areas it was 1.29%. The frequency was higher in the first and second year classes in both areas, mainly in boys rather than girls. The morbidity figures were higher than those in other cities in Japan and in foreign cities except for Aberdeen.

61657 **APTIC NO. 82434**

Tanaka, M. and E. Dodo

EFFECTS OF AIR POLLUTION ON RESPIRATORY SYSTEM IN CITIES OF OTAKE, KURE AND FUKUYAMA, 1974. *(Otake, Kure oyobi Fukuyama shi ni okeru taikiosen no kokyuki ni oyobosu eikyo, 1974). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 28(12):1279-1291, 1975. 8 refs.*

The results of a survey on subjective respiratory symptoms, (based on the BMR method) in Otake, Kure, and Fukuyama during October-December, November-December, and September-November, respectively are presented. In Otake, although the effects of air pollution were not clearly recognizable, there was a fairly high rate of complaints about eye irritation, and so the possibility of an effect due to air pollution could not be ruled out. Although in Kure the degree of air pollution recently showed an improvement, some effects of air pollution still appeared. In Fukuyama, especially in a relatively highly polluted area of Akebono, the effect of air pollution was identifiable.

61658 **APTIC NO. 80053**

Tate, M.

ENVIRONMENTAL POLLUTION DUE TO MANGANESE AND ITS TOXICOLOGY. *(Mangan ni yoru kankyo osen to sono toxicology). Text in Japanese. Preprint, Japan Pharmaceutical Assoc., Tokyo, 8p., 1975. 65 refs. (Presented at the Environmental Toxicology Symposium, 2nd, Gifu, Japan, Oct. 27, 1975.)*

Although a deficiency of manganese disturbs the growth of animals and plants, an excess intake of manganese, especially as dust causes two types of disorder; manganese-pneumonia and central-nervous system disturbances. The methods of measuring manganese dust and some measurements in the air around a ferro-manganese factory and in large cities are discussed. The average intake of a Japanese was estimated at 1.108 mg/day from the air. An outline of the metabolism of manganese in the human body, its toxicology, and related parenchymal denaturation, magnisms, and pneumonia (croupous) are described.

61659 **APTIC NO. 83368**

Taushan, M. D.

MICROELEMENTS AND ELECTROLYTES OF THE BLOOD IN CHRONIC MICROINTOXICATIONS WITH ZINC COMPOUNDS. *(Mikroelementy i elektrolity krovi pri khronicheskikh mikrointoksikatsiyakh soedineniyami tsinka). Text in Russian. Vrachebnoe Delo (Kiev), no. 8:137-140, 1975.*

Results of the general clinical and hematological examinations of 132 workers exposed to zinc oxide and zinc sulfate aerosols in concentrations for exceeding the MAC values are presented. The test group included 25 women with an average age of 41 yr and occupational exposure to zinc for 16.8 yr, and 107 men with an average of 39.9 yr, and occupational exposure for 14.1 yr. Different morbid changes, such as neurotic disorders, gastritis, gastric and duodenal ulcer, and lesion of the upper respiratory mucosa were found in 45.5% of the workers. This incidence is significantly higher than that found in a comparable control group. Significantly increased iron, copper, magnesium, manganese and calcium levels were found in the blood of the exposed subjects compared with a group of healthy blood donors. The magnesium, iron and copper levels were significantly higher in workers showing symptoms of chronic poisoning with zinc than in symptom-free workers. The potassium and sodium levels in the blood showed no changes as a function of exposure.

61660 **APTIC NO. 82261**

Tomita, K., M. Oka, T. Kawaraya, and T. Haruki

LOCAL COMPARISON OF RESPIRATORY FUNCTION OF HEALTHY ADULTS EXAMINED BY THEIR FLOW-VOLUME CURVES. *(FV-kyokusen yori mita kenko-seijin kokyukino no chiiki hikaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):493, Nov. 1975.*

Respiratory functions of policemen (1280 in outside duties and 991 in inside duties; 1786 smokers and 485 nonsmokers) in Osaka Prefecture was determined by spirometer in Feb. and March 1974 and 1975; MMF was measured in 1974, and respiratory resistance was measured in 1975. The locality was divided into 2 areas, I and II. The determined values (FEV(1.0), V(50), V(25), V(50)/V(25)) and the index of cardiopulmonary function were used to detect persons with lowered respiratory function. The results showed that the percentage of persons with lowered respiratory function was higher in nonsmokers in outdoor duties in area I than in area II. The percentage was generally higher in smokers than in non-smokers in both I and II areas. Area I included the center of Osaka City.

61661 **APTIC NO. 83005**

Tanokura, K. and K. Nakajima

ASSESSING NECESSARY AMOUNT OF NURSING NEEDED BY AGED PERSONS IN AN AIR POLLUTED AREA. *(Taikiosen chiiki no okeru rojin kangoryo no haaku). Text in Japanese. Hokenfu Zasshi (Japan. J. Pub. Health Nurse), 31(7):433-442, 1975. 19 refs.*

The results of a survey of the effects of air pollution on aged persons living in an industrialized area in Ichihara are outlined. The possibility of providing nursing for such persons is considered. Air pollution in the coastal part of the city included 0.5-0.2 mg SO4/day/sq m (PbO2 method). The survey was carried out on persons older than 60 in the highly polluted Kita-aoyagi area and the non-polluted Kamitakane area. Questionnaires based on the BMRC method were given, and disease histories and complaints were recorded. The percentages of complaints of persistent cough with phlegm and of ocular symptoms were higher in the more polluted area of Kita-aoyagi. The percentage of persons with disease histories of the circulatory system was also higher in the Kita-aoyagi area. The percentages of other physical complaints and diseases were also higher in the Kita-aoyagi area. Complaining people also had a less active life than others of their age. These facts suggest the necessity of nursing for aged persons in an air-polluted area. The greatest problem in both areas was found to be the management of diseases of the circulatory system.

61662 **APTIC NO. 79984**

Toyama, T. and J. Kagawa

MORBIDITY OF CHRONIC BRONCHITIS IN JAPAN--GENERAL DESCRIPTION OF THE RESULTS OF A SURVEY ON THE MORBIDITY OF RESPIRATORY SYMPTOMS THROUGHOUT JAPAN USING STANDARD QUESTIONNAIRES. *(Nihon ni okeru mansei kikanshien no yushoritsu--Hyojun shitsumonho o mochiita zenkokuteki na kokyuki shojo yushoritsu chosa ni taisuru sosetsu). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 35:95-106, Sept. 1975. 20 refs.*

A general summary of the results of studies and surveys on respiratory symptoms, especially the morbidity of chronic bronchitis from 1965 to 1973, is presented. The questionnaires of the British Medical Research Council were used, and the survey was carried out on 22,590 persons in 21 regions. The morbidity of continued cough and sputum was, on the average, relatively lower than in the UK and U S. There is reason to fear that the rapid industrialization with attendant heavy air pollution and the historically recent smoking habit of the Japanese, as well as the excess population, may cause increasing morbidity of unspecified respiratory diseases, approaching to the level of European countries.

61663 **APTIC NO. 82232**

Tozawa, T., K. Abe, K. Omori, and M. Yamaga

EXAMINATION OF VANADIUM CONTENT OF TEETH OF INHABITANTS IN KAWASAKI CITY. *(Kawasaki-shi jumin no shiga-chu vanadiumryo no kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):498, Nov. 1975.*

The vanadium content of teeth obtained from dentists in Kawasaki City was determined for the 5 Wards of the City. Male and female teeth (there were no sex differences) were compared between the Wards. The vanadium content was significantly lower in Tama Ward, followed by Takatsu, Nakahara, Kawasaki and Saiwai Wards in the order. The vanadium content of teeth of the inhabitants reflected the state of environmental pollution due to combustion products from the Tokyo-bay coastal industrial zone, consisting of iron and steel industries and oil-burning power stations.

61664 **APTIC NO. 82439**

Tsukamoto, C., S. Serizawa, H. Akita, and K. Hirabayashi

AIR POLLUTION AND THE INFANTILE SYMPTOMS OF COLD PART 2. *(Taikiosen to kodomono kaze shojo, 2). Text in Japanese. Shoni Hoken Kenkyu (J. Child Health), 34(5):262, 1975.*

Symptoms of cold such as sniffling, coughing, and stridor were observed from Nov. 1972 to Nov. 1973 in 12,826 of a total of 30,357 infants in 15 medical centers in Osaka Prefecture. The yearly average morbidity was 42%; monthly average morbidity was highest in April and lowest in August, (56 and 25%, respectively). There was a close connection between the monthly morbidity and average concentrations of sulfur dioxide and nitrogen dioxide in the air. Further, the weekly average morbidity of cold symptoms showed a correlation to weekly average concentrations of sulfur dioxide and nitrogen dioxide, even when the concentration of sulfur dioxide was less than 0.04 ppm (average of 24 hr), which is the national standard.

61665 **APTIC NO. 70736**

Tsunetoshi, Y.

PROGRESS OF EPIDEMIOLOGICAL STUDIES ON THE EFFECTS OF AIR POLLUTION ON HUMAN HEALTH. *(Taiki osen jintai eikyo no ekigaku kenkyu no ayumi). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 4(2):135-141, Feb. 1975. 28 refs.*

The history of effects of air pollution in Japan is briefly described. U. S. soldiers bronchial asthma cases in 1951 in the Tokyo area and frequent occurrences of asthma and asthmatic bronchitis in Isozu, Yokkaichi after the completion of the Yokkaichi Petroleum Complex in 1960 were the first time air pollution effects were surveyed. The air pollutants studied changed from sulfur dioxide to nitrogen oxides to photochemical oxidant. The human effects were at first and are still confined mainly to respiratory disorders with the improvement of detecting methods for vital capacity and respiratory function and with introduction of immunological information and studies of pulmonary surfactants. The epidemiological survey itself changed from the research stage to administrative stage. There was a relatively large change before and after the promulgation of the Law of Special Treatment of the Victims due to Environmental Pollution. The epidemiological surveys of human health effects by air pollution were carried out after the socialization of the problem.

61666 **APTIC NO. 82415**

Tsunetoshi, Yoshizo

STUDIES ON PULMONARY FUNCTION AMONG SCHOOLCHILDREN WITH SPECIAL REFERENCE TO EFFECT OF AIR POLLUTION. *(Gakudo no kokyukino no seijochi to taikiosen no eikyo). Text in Japanese. Osaka Daigaku Igaku Zasshi (Med. J. Osaka Univ. Japan Ed.), 27(1-5): 13-34, 1975.*

A study attempting to find normal values for pulmonary function and to derive a formula to predict vital capacity and to elucidate the effects of air pollution on the respiratory function of schoolchildren is described. Data on 19,351 schoolchildren were collected and analyzed for 5 years after 1965 in Chiba, Mie, and Osaka Prefectures. The vital capacity, one-second value, 0.75-second value, and 0.5-second value were larger in boys than in girls of the same school grade, with the same height. The values were higher in boys and girls in higher grades among those with the same height. The values were higher in boys and girls with greater height among those in the same grade. Two formulas were obtained for boys and girls, respectively, which correlated the prediction of vital capacity with body height and age. In 4 air-polluted areas, the vital capacity was compared to the value predicted by the formula. The difference was larger as the degree of air pollution was higher. The one-second rate, 0.75-second rate and 0.5-second rate (averaged) were lower in schoolchildren in polluted areas than in non-polluted areas. The difference was larger as the degree of air pollution was higher.

61667 **APTIC NO. 83188**

Tsunetoshi, Yoshizo

STUDIES ON PULMONARY FUNCTION AMONG SCHOOLCHILDREN WITH SPECIAL REFERENCE TO EFFECT OF AIR POLLUTION. *(Gakudo no kokyukino no seijochi to taiki osen no eikyo). Text in Japanese. Osaka Daigaku Igaku Zasshi (Med. J. Osaka Univ. Japan. Ed.), 27(1-5):13-14, 1975. 51 refs.*

The health and pulmonary function of schoolchildren in 3 polluted areas of Chiba, Mie, and Osaka Prefectures and a non-polluted area from 1965 to 1970 were studied. The morbidity of asthma, and body height, body weight, exercised vital capacity, and 1.0, 0.75 and 0.5-sec volumes were studied individually and analyzed by computer. An area where the concentration of sulfur dioxide (Pb dioxide method) was less than 0.3 mg/day/100 sq cm was regarded as non-polluted. For children in the non-polluted area, the exercised vital capacity and 1.0, 0.75 and 0.5-sec rates were larger in boys than in girls of the same age class within groups of the same body height; these values in the same height group were larger at higher ages. Boys and girls of the same age class showed higher values with greater body height. The vital capacity rate was also dependent on body height. Formulae were obtained for predicting exercised vital capacity from body height and age. When the predicted value and the measured values for children in polluted areas were compared, the differences (lower for the actually determined values than the theoretical predicted values) were larger as the degree of pollution was higher. The rate of exercised vital capacity was lower as the degree of pollution was higher.

61668 **APTIC NO. 84266**

Tsunoda, F.

EFFECTS OF FLUORIDES IN THE AIR ON HUMAN BODY. *(Taiki-chu no fukkabutsu ni yoru jintai eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):210-214, Nov. 1975.*

Although a dose-response relationship was established for the more than 130 million persons drinking potable water with added fluorine (around 1 ppm), the effects of fluorides in air on the human body could not be simply evaluated by such a dose-response relationship because of the accumulated pollution on agricultural crops. It is necessary first to measure the fluorine in fluorine-polluted food crops. Experiments with humans given a standard diet for 5 days, then a diet from crops grown in a fluorine polluted area for 2 days, and then standard diets again for 3 days were conducted. The fluorine intake was 1.6-2.1 mg/day from the standard diet and 7.5-8.2 mg/day from polluted crops. From analysis of feces and urine of animals it was determined that accumulation of fluorine is conspicuous only in hard tissue (5000 ppm and 3000 - 4000 ppm in the dried fat of cows and sheep respectively after 3 years: 4 times that of control animals). Human absorption and excretion of sodium fluoride was measured. Slight irritation of mucosa and skin and a decrease of pulmonary ventilatory function was found epidemiologically; hcwever, the result of long-term exposure to concentrations of less than 10 ppb was not known. The average content of fluorine in the urine of Japanese males is 0.69 plus or minus 0.58 mg/day.

61669 **APTIC NO. 76263**

Ueda, M., N. Nakayama, Y. Tsunetoshi, and R. Ebata

ON THE RESULTS ON SURVEY ON CHRONIC BRONCHITIS IN AKAHO CITY. *(Akaho shi ni okeru manseikikanshien chosa seiseki ni tsuite). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 22(10):405, Oct. 1975.*

An epidemiological survey of chronic bronchitis was carried out on the inhabitants of Akaho City in Hyogo Prefecture. The results were compared to those obtained in the yearly surveys from 1966 to 1968 from the viewpoint of the relationship between the variation of air pollution and that of the morbidity of chronic bronchitis. The items in the survey were the same as in 1966 - 1968: BMRC inquiries, physical and respiratory function examination, and chest roentgenography. After normalizing the morbidity of chronic bronchitis due to smoking, the morbidity was higher as the concentration of sulfur dioxide in air was higher, without, however, local differences. The amount of floating dust (in microgram/cu m), nitric oxide and nitrogen dioxide (in ppb), and sulfur dioxide (in ppb) in the center of the city averaged 21, 13, 18, and 22, respectively in 1971, and 49, 10, 24, and 20 in 1974. The frequency of obstructive disturbance was highest (15.4%) in chronic bronchitis patients of both sexes. When the results were compared to those in 1966 - 1968 (3.5 - 2.5%) and 3.5-2.3%), the variation of sulfur dioxide concentration with the morbidity of chronic bronchitis was consistent.

61670 **APTIC NO. 82256**

Ueda, M., N. Nakayama, and Y. Tsunetoshi

YEARLY CHANGE OF SUBJECTIVE SYMPTOMS AND RESPIRATORY FUNCTION OF LOCAL GENERAL INHABITANTS. *(Chiiki ippan jumin no jikaku-shojo oyobi kokyukino no keinenteki henka). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):494, Nov. 1975.*

The relationship between air pollution and yearly changes of respiratory symptoms and the respiratory functions of the general population were studied. Subjective symptoms were recorded by BMRC survey. Respiratory functions, chest-roentgenography, sputum, urine, and physical examinations were studied for the 4 years since 1971. The investigated areas were Osaka City (with many small factories), and a rural area. The degree of air pollution in the Osaka area was two times that of the rural area in 1970; however, the former decreased to become almost the same as the rural area. The decrease of air pollution from 1971 to 1974 was not directly connected to the decrease of morbidity of respiratory symptoms. In areas where the degree of air pollution was not high, the change of respiratory symptom morbidity was too large to be accounted for by the change in the severity of air pollution.

61671 **APTIC NO. 76608**

Ulmer, Wolfgang T.

CRITERIA FOR THE DETERMINATION OF DAMAGE TO THE LUNGS AND BRONCHIA BY DUSTS AND GASES. *(Kriterien zur Feststellung von Schaeden an Lungen und Bronchien durch Staeube und Gase). Text in German. Staub, Reinhaltung Luft, 35(11):393-397, 1975. 20 refs.*

Four different effects of dust on the broncho-pulmonary system are discussed: typical effects of dust, hypersensitivity of the bronchial system, obstructive lung disease, and restrictive disturbances of the lung function due to effects on interstitial tissues. Methods of diagnosing typical impairments of lung function are described, and the importance of early diagnosis, which may be possible only with modern methods, is explained. Inhaled pollutants that cause lung disease are discussed, and the later stages of lung disease are described. The necessity for cooperation among agencies and personnel responsible for the control and treatment of occupational lung disease is stressed.

61672 **APTIC NO. 79620**

Umeda, M., T. Suzuki, S. Nakazawa, H. Goto, and S. Nagaoka

EFFECTS OF EXPOSING RATS TO NITROGEN DIOXIDE AND OZONE. *(NO2 to O3 bakuro no rat ni oyobosu eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):476, Nov. 1975.*

Rats (SD-JCL, male, 10 weeks in age) were exposed in 4 groups to (1) nitrogen dioxide (at 30 ppm for 3 hr), (2) ozone (at 3 ppm for 3 hr), (3) nitrogen dioxide (at 30 ppm for 1.5 hr) and then ozone (at 3 ppm for 1.5 hr), and (4) nitrogen dioxide (at 30 ppm for 3 hr) and then ozone (at 3 ppm for 3 hr). There was no significant change in red blood count, hematocrit, hemoglobin, SH group in blood, serum LDH, albumin total protein, or cholesterol; however, the change was larger in the ozone-exposed group than in the nitrogen oxide-exposed group. The change was smaller in the group exposed to nitrogen dioxide for 3 hours and then to ozone for 3 hours than in the ozone-only group. The effect on ALP, reticulocyte, and N/LY just after exposure and ablation of the tracheal epithelium were not seen in group 4, and the state of group 3 was intermediate between that of groups 4 and 2. These findings suggest that the effects of exposure to ozone were influenced by the pre-exposure to nitrogen dioxide.

61673 **APTIC NO. 82262**

Ushijima S., S. Shimada, Y. Iwai, K. Aoyama, and S. Takeuchi

EFFECTS OF AIR POLLUTION ON AIR WAY, ESPECIALLY ON UPPER AIRWAY. *(Taikiosen no kido ni oyobosu eikyo, tokuni jokido). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 22(10):410, Oct. 1975.*

The defence mechanism of living bodies was considered, emphasizing the filtering function of the upper airway. The role of the filter was examined with interviews and clinical tests. The hypersensitivity of the first filter, the nose, was reduced by polluted air, thus destroying the filter function. A greater, compensatory burden was thus imposed on the filters of higher (inner) order. The onset of airway diseases possibly due to air pollution was evident from the relationship between clinical disease states and intracutaneous responses to several antigens.

61674 **APTIC NO. 79770**

Valkovic, Vlado, Dubravko Rendic, and G. C. Phillips

ELEMENTAL RATIOS ALONG HUMAN HAIR AS INDICATORS OF EXPOSURE TO ENVIRONMENTAL POLLUTANTS. *Environ. Sci. Technol., 9(13):1150-1152, Dec. 1975. 17 refs.*

Trace element ratios along human hair on a Yugoslavian population group were measured by photon induced X-ray spectroscopy. The elements whose concentrations increase along the hair are pollutants in the area. The measurements give information on the exposure of subjects to different pollutants, and the history of the exposure manifest in the variations of concentrations along the hair. For widespread pollutants, such as lead, even the medium value of a group of subjects can be used as a measure of the exposure. (Author abstract modified)

61675 **APTIC NO. 82564**

Van Duuren, Benjamin L.

ON THE POSSIBLE MECHANISM OF CARCINOGENIC ACTION OF VINYL CHLORIDE. *Ann. N. Y. Acad. Sci., vol. 246:258-267, 1975. 51 refs.*

An attempt is made to bring together relevant information bearing on the possible mechanism of action of the carcinogen vinyl chloride. The relationship of indirect-acting alkylating carcinogens and their direct-acting counterparts is described. An alpha-chloro ether or related -onium ion intermediate may be involved as an activated carcinogenic intermediate in vivo. Noncovalent binding to serum albumin, microsomal membranes, or other target sites may precede activation to a carcinogenic intermediate. Serum albumin binding may be related to the site of origin of acroosteolysis, a disease associated with exposure to vinyl chloride. Trichloroethylene is a widely used industrial chemical. Based on its structural similarity to vinyl chloride and known information concerning its metabolism in animals and humans, an alpha-chloro ether or -onium ion may be an important intermediate in its metabolism. It is likely to be carcinogenic, particularly to the liver, but this remains to be established. Other chemical agents known to be carcinogenic to animals and humans are briefly mentioned. (Author abstract modified)

61676 **APTIC NO. 82550**

Vlc, Z., H. Lazarova, V. Tunysova, and V. Malkova

CHRONIC BRONCHITIS IN WOMEN RESIDENTS OF AN URBAN ESTATE IN OSTRAVA. *(Chronika bronchitida u zen v obvodu mestskeho sidliste v Ostrave). Text in Czech. Studia Pneumol. Phtiseol. Cech., 35(9):606-611, 1975. 14 refs.*

Methods of case finding and epidemiological questions of chronic bronchitis affecting females living in an urban community (Ostrava-Prouba Estate) and of women of a rural community are described. Data were obtained from 3531 females aged 14-50 from the urban area and 858 persons of the same age including 493 females living in the rural community. The data include: a questionnaire, miniature chest film, measurements of height and weight, and forced expiratory volume determination for 1 sec. There was a 75% incidence of chronic bronchitis among women with a suspicious symptomatology or whose symptoms corresponded to Fletcher s classification of chronic bronchitis. Another 19.3% of the women either smoked or worked in a dust hazard environment.

61677 **APTIC NO. 80003**

Vlckova, Angelika, Ludovit Takac, and Gertruda Urbankova

RAT AND RABBIT RESPONSE (IN RELATION TO AGE) TO INHALATION OF AUTOMOBILE EXHAUST FUMES. *Sci. Total Environ., 4(3):311-315, Sept. 1975. 4 refs.*

Rats, approximately 6 wk old weighing 119 g and approximately 8 wk old and 163 g, were exposed for 3 and 30 days to automobile gases diluted with air. Rabbits weighing 1.88 kg were exposed for 24 days. Body weight, the number of alveolar macrophages (AM) in the lung washings, damage to the cytoplasmic membrane of the AM, glucose-6-phosphate dehydrogenase activity (G6PD) in the AM, and acid-base balance in the capillary blood of the rabbits were measured. The 30-day exposure to automobile exhaust gases significantly inhibited growth in both age groups. The number of AM was elevated in both groups. The activity of G6PD increased in the AM of the younger animals and decreased in the older animals, compared with the controls. The number of dead AM was higher for the older than the younger rats. No significant difference was found in the number of AM washed from the lungs of both exposed groups after the 3-day exposure. However, G6PD activity and the number of viable AM in the older animals decreased and the percent of dead phagocytes was significant. The opposite effect occurred in the younger group. Alterations of lung tissue structure in the exposed animals were apparent. The acid-base response showed metabolic and respiratory disturbances, evidenced by a decrease in carbon dioxide tension, a rise of hemoglobin, and a base excess. The gases affected the cells of lung defence-alveolar macrophages and their biosynthetic activity. (Author abstract modified)

61678 **APTIC NO. 84417**

Vouk, V. B.

DEVELOPMENT OF CRITERIA PERTAINING TO HEALTH EFFECTS OF POLLUTANTS. *IPIECA, Petrol. Environ. Conserv. Symp. Rep., Tehran, Iran, 1975, p. 257-270. 21 refs. (April 7-9, Paper 9.)*

The development of criteria pertaining to health effects of pollutants is discussed. Environmental health criteria documents contain information on the chemical and physical properties of the pollutant, on sources of environmental pollution, on environmental exposure levels; on environmental distribution, transport, transformation, and bio-concentration; on uptake, distribution in and elimination from the organism; on metabolism and biochemical effects; experimental toxicity studies, including interactions; epidemiological and clinical studies; estimates of the total human exposure from all sources and on quantitative aspects of exposure effect relationships; maximum permissible levels as established in different countries for various environmental media; and guidelines for the establishment of exposure limits.

61679 **APTIC NO. 83086**

Vyslouzil, Z., D. Toserova, J. Dolensky, M. Sukova, V. Tunysova, and R. Cichon

THE INCIDENCE OF CHRONIC BRONCHITIS IN ADOLESCENTS. *(Vyskyt chronicke bronchitidy u mladistvych). Text in Czech. Studia Pneumol. Phtiseol. Cech., 35(9):591-595, 1975. 8 refs.*

The incidence of chronic bronchitis was investigated in 11,047 adolescents in three localities (Ostrava, Most, Kolin) with varying grades of atmospheric pollution. Chronic bronchitis was diagnosed is 260 (2.35%) cases. The incidence was highest in Ostrava (3.7%), the locality where dust fall-out was highest. Data obtained in Kolin and Most did not differ statistically (1.6 and 1.5%). Among preschoolers bronchial asthma was the most important cause for the later development of chronic bronchitis.

61680 **APTIC NO. 79636**

Wakisaka, I.

EFFECT OF NICOTINE AEROSOL ON THE UPPER AIRWAY-STIMULATING ACTION OF SULFUR DIOXIDE. *(Aryusan gas no jokido shigekisayo ni oyobosu nicotine aerosol no eikyo). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 22(10): 393, Oct. 1975.*

Possible inhibiting effects of nicotine on the respiration- stimulating action of sulfur dioxide were studied with mice. A single exposure to nicotine caused transient repression of the respiration of mice, which was thought to be the result of effects of nicotine on nerve receptors in the upper airway. The repression changed to hyper-respiration. The initial decrease of respiration was proportional to the logarithum of nicotine concentration at less than 40 microgram of nicotine/l of air. When mice were exposed to sulfur dioxide at about 150 ppm just after exposure to 0.6-88.5 microgram of nicotine/l of air, respiration decreased. When mice were simultaneously exposed to sulfur dioxide (at constant concentration) and nicotine, the % reduction of respiration was smaller as the concentration of nicotine was higher, and the recovery took more time than in cases of single exposure to either nicotine or sulfur dioxide. When mice were exposed to nicotine at constant concentrations just after exposure to sulfur dioxide, the sulfur dioxide did not affect the respiration response to nicotine. It was concluded that receptors for nicotine differ from those for sulfur dioxide, and that the simultaneous exposure to nicotine and sulfur dioxide makes the repression of respiration (a protective mechanism) weaker, and accelerates the intrapulmonal invasion by sulfur dioxide.

61681 **APTIC NO. 76592**

Waldron, H. A.

HEALTH STANDARDS FOR HEAVY METALS. *Chem. Brit., 11(10):354-357, Oct. 1975. 12 refs.*

Problems in assigning toxicological standards for heavy metals are discussed. The metals are encountered in food and drink as well as in the air. Almost all current standards relate to experience in industry where the main risk is from airborne dust or fume. Chronic exposure to doses of these metals, which are insufficient in themselves to give rise to recognizable clinical poisoning, may, nevertheless, be harmful. Provisional tolerable weekly intakes were proposed for a 60 kg adult: 0.3 mg mercury, 0.4 to 0.5 mg cadmium, and 3 mg lead. The mean level of mercury in food is of the order of 0.005 mg/kg. The safety margin for children is less than for adults. The situation with respect to cadmium is worse than with mercury. Stringent downward revision of the current regulations concerning lead in food is recommended. The maximum content of mercury in food which should be allowed seems to be 0.008 mg/kg. The World Health Organization upper limit for cadmium in water allows a 10 kg child to ingest nearly three times his tolerable limit. Current heavy metal levels in food are discussed. Heavy metals may produce additive effects. Recommendations are made for allowable concentrations in food and water. Manufacturers should also be required to list the maximum concentration of heavy metals on their packaged foods.

61682 **APTIC NO. 79683**

Waldron, H. A.

SUBCLINICAL LEAD POISONING: A PREVENTABLE DISEASE. *Preventive Medicine, vol. 4:135-153, 1975. 134 refs.*

The health effects and prevention of subclinical lead poisoning are discussed. The most serious health effects are the production of hyperactivity in children and some adult deliquents. These effects are produced when the blood Pb concentration is considerably lower than those which have formerly been associated with clinical poisoning. The best means of preventing subclinical Pb poisoning is by minimizing the release of Pb into the environment since this results in a reduction in the degree of absorption. A number of countries have recommendations for maximum concentration of Pb in the atmosphere which from from a high of 20.0 micrograms/cu m in Canada to a low of 0.7 micrograms/cu m in Czechoslovakia, East Germany, and USSR. Lead in the atmosphere comes almost exclusively from Pb in gasoline, although industrial sources contribute varying amounts to local concentrations.

61683 **APTIC NO. 83892**

Ward, Richard B.

THE SAFETY OF FLUOROCARBON BLOWING AGENTS FOR POLYURETHANE FOAMS. *J. Cellular Plastics, 11(6):313-316, Nov./Dec. 1975. 5 refs.*

The safety of fluorocarbon blowing agents for polyurethane foams is discussed and measurements made at manufacturing plants are presented. When air containing Fluorocarbon 11 is inspired, some transfer of the fluorocarbon to the blood occurs in the lungs. There is little or no biogradation in the body. Two adverse effects are produced after exposure to concentrations much higher than the TLV (1000 ppm): central nervous system depression and cardiac sensitization. Concentrations of Fluorocarbon 11 at formulation facilities are tabulated. Vapor losses even during drumming are kept to a minimum, close to the practical limit of measurement. Fluorocarbon vapors are heavier than air and accumulate at floor level. The most efficient way to ventilate the building is through ducts drawing out air at floor level.

61684 **APTIC NO. 72533**

Watanabe, H.

AIR POLLUTION AND ITS CARCINOGENECITY: BENZO(A)PYRENE AS A CENTER OF DISCUSSION. *(Taiki-osen to gangensei, tokuni BaP o chusin to shite). Text in Japanese. Taiki-Osen Nyusu (Air Pollution News), no. 86:6-7, Jan. 1975.*

The carcinogenicity of benzo(a)pyrene is reviewed. Carcinogenic substances in air pollutants exist in respirable dust which has high sedimentability in the lung, dimensions less than 8 micron, and therefore benzo(a)pyrene would be an indicator of carcinogenic substances in an air pollutant. The biological method of examination of carcinogenic substances in air pollutants using Salmonella typhimurium is reported and the relationship between mutagenecity and carcinogenecity of polycyclic aromatic hydrocarbons is discussed. There is a high carcinogenecity in benzene-extractable fractions of air pollutants nearyl 100 times as large that of benzo(a)pyrene. Results of inhalation of heavy oil combustion products on laboratory animals showed lungs with a proliferation of fiberous tissues similar to human responses. More frequent proliferation was seen in dog lungs in Tokyo than in other cities. The results of a survey of mortality due to lung cancer showed the local distribution of mortality coincided with the distribution of auto exhaust and soot in Osaka.

61685 **APTIC NO. 83430**

Waters, M. D., D. R. Abernethy, H. R. Garland, and D. L. Coffin

TOXIC EFFECTS OF SELECTED METALLIC SALTS ON STRAIN WI-38 HUMAN LUNG FIBROBLASTS. *Preprint, Tissue Culture Assoc., 22p., 1975. (Presented at the Tissue Culture Association, Incorporated Meeting, Annual, 26th, Montreal, Quebec, June 2, 1975, Paper 19.)*

The toxic effects of various metal ions on human lung fibroblasts were investigated. Cultures exposed for 20 hr showed a 50% reduction in numbers of viable cells when exposed to concentrations of cadmium, platinum, and vanadate ranging from 0.001-0.004 molar. Concentrations exceeding 0.001 molar were required to produce a similar response with nickel, manganese, and chromium. Total adenosine triphosphate was depressed in the presence of cadmium, platinum, and vanadate at concentrations lower than those causing reduction in cell viability. Deoxyribonucleic acid, ribonucleic acid, and protein biosynthesis were 50% inhibited by cadmium, platinum, and vanadate at concentrations ranging from 0.00001- 0.00009 molar. Evidence of preferential inhibition of radiocarbon-labeled thymidine incorporation into acid precipitable material was obtained with platinum. This effect was not observed with cadmium or vanadate. However, all three metals appeared to impair the incorporation radiocarbon-labeled uridine into the acid soluble pool.

61686 **APTIC NO. 83431**

Waters, Michael D., Gunnar F. Nordberg, C. Christine Cox, T. Owens Vaughan, and David L. Coffin

CELLULAR TOXIC EFFECTS OF CADMIUM AND OTHER METALS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Karolinska Institutet, Stockholm (Sweden), and Northrop Services, Inc., Research Triangle Park, N. C., 25p., 1975. (Presented at the International Conference on Heavy Metals in the Environment, Toronto, Ontario, Oct. 26-31, 1975.)*

The toxic effects of cadmium and other metal ions on rabbit alveolar macrophages and human lung fibroblasts are reviewed. At low extracellular concentrations, cadmium enters both types of pulmonary cells slowly and binds to intracellular low molecular weight soluble components. There is evidence of a threshold concentration for cytolethality and perhaps an associated time factor. The presence of limited protection mechanisms which may diminish the cellular toxicity of cadmium on acute exposure is suggested. Soluble chlorides of cadmium, nickel, manganese, and chromium as well as ammonium vanadate are capable of causing reduced cell viability, decreased numbers of cells, depressed acid phosphatase specific activity, and altered surface morphology in alveolar macrophages.

61687 APTIC NO. 83432

Waters, M. D., T. O. Vaughan, J. A. Campbell, F. J. Miller, and D. L. Coffin

SCREENING STUDIES ON METALLIC SALTS USING THE RABBIT ALVEOLAR MACROPHAGE. *Preprint, Tissue Culture Assoc., Inc., 21p., 1975. (Presented at the Tissue Culture Association, Incorporated Meeting, Annual, 26th, Montreal, Quebec, June 2, 1975, Paper 18.)*

The effects of metallic salts on rabbit alveolar macrophages were investigated. Chlorides of mercury, copper, and zinc were non-lytic over a concentration range of 0.0001-0.01 molar which produced a 50% reduction in cell viability. Phagocytic activity in the presence of cadmium, Hg, Cu, Zn, and nickel cations was decreased to 50% of the control value over a concentration range of 0.00003-0.0004 molar, a lower concentration than that required to cause a comparable reduction in cell viability. Total adenosine triphosphate levels were also depressed to 50% of the control values at concentrations of each cation comparable to or lower than those causing a 50% decrease in phagocytic activity. (Author abstract modified)

61688 APTIC NO. 83433

Waters, M. D., T. O. Vaughan, J. A. Campbell, A. G. Stead, and D. L. Coffin

ADENOSINE TRIPHOSPHATE CONCENTRATION AND PHAGOCYTIC ACTIVITY IN RABBIT ALVEOLAR MACROPHAGES EXPOSED TO DIVALENT CATIONS. *Preprint, Reticuloendothelial Society, 18p., 1975. 3 refs. (Presented at the Reticuloendothelial Society National Meeting, 12th, Miami, Fla., Dec. 6, 1975, Paper 57.)*

The effect of divalent metal cations on adenosine triphosphate concentration and phagocytic activity in rabbit alveolar macrophages was investigated. The ATP/protein ratio was depressed to the greatest extent by mercury and cadmium and to a lesser extent by zinc, copper, and nickel, respectively, in macrophages that were exposed for 20 hr to concentrations of the metals ranging from 2 micromoles to 5 millimoles. The phagocytic activity was depressed by the five metals in the same order and to approximately the same extent as the ATP/protein ratio. At the level of the 50% response, Hg caused the greatest depression in phagocytic activity, follwed by Cd, Zn, Cu, and Ni, in that order. Higher metal concentrations were required to alter cell viability than were required to cause depression in total ATP or phagocytic activity, and this effect was particularly noticeable for zinc and nickel.

61689 APTIC NO. 83437

Waters, Michael D., T. Owens Vaughan, Diane R. Abernethy, Helen R. Garland, and David L. Coffin

TOXICITY OF PLATINUM (IV) SALTS FOR CELLS OF PULMONARY ORIGIN. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Pathobiology Research Branch, 35p., 1975. 15 refs. (Presented at the Heavy Metals in the Environment Conference, III, Chapel Hill, N. C., May 15-16, 1975 and at the Tissue Culture Association, Incorporated Meeting, Annual, 26th, Montreal, Quebec, June 2-5, 1975.)*

The acute toxicity of tetravalent platinum was studied in vitro using rabbit alveolar macrophages and human lung fibroblasts. Alveolar macrophages were exposed in tissue culture for 20 hr to platinum dioxide or platinum tetrachloride. There was no evidence of dissolution of PtO2 and no decrease in viable cells at concentrations as high as 500 micrograms/ml. Platinum tetrachloride was soluble in the macrophage system and at a concentration of 59 micrograms/ml (20-hour exposure) resulted in a loss of viability in 50% of the cells originally present. Rapidly growing human lung fibroblasts were rendered non-viable by PtCl4 at comparable concentrations after a 20-hour exposure. A decrease in total cellular adenosine triphosphate was observed at lower concentrations in macrophages as compared with controls. A 50% decrease in the incorporation of radiocarbon- labeled thymidine was observed in fibroblasts after a 22-hour exposure to PtCl4 at a concentration of 0.007 millimoles; higher concentrations were required to inhibit the incorporation of radiocarbon-labeled uridine and leucine. The inhibition of thymidine incorporation was nearly complete (90%) after 7 hr in the presence of 0.06 millimoles PtCl4. Under the same conditions, there was little inhibition (15%) of leucine incorporation and moderate inhibition (50%) of uridine incorporation. Higher concentrations of PtCl4 were required to inhibit thymidine incorporation into the acid-soluble fraction than were required to inhibit incorporation into the acid-precipitable fraction. The preferential inhibition of deoxyribonucleic acid synthesis by PtCl4 may thus result from an impairment of the incorporation process. (Author abstract modified)

61690 APTIC NO. 84123

Weber, Annetta, Carol Jermini, and Etienne Grandjean

EFFECTS OF LOW CARBON MONOXIDE CONCENTRATIONS ON FLICKER FUSION FREQUENCY AND ON SUBJECTIVE FEELINGS. *(Wirkungen niedriger Kohlenmonoxid-Konzentrationen auf die Flimmerverschmelzungsfrequenz und das subjektive Befinden des Menschen). Text in German. Int. Arch. Occup. Environ. Health, 36(2):87-103, 1975. 29 refs.*

Contradictory results in the literature on the effects of carbon monoxide suggest that subject responses may vary with the degree of activation of the subjects. Twenty healthy nonsmokers were examined in an exposure chamber. Ten participated in activating and monotonous situations, with and without exposure to CO. Ten participated only in the monotonous situation. The CO concentration in the chamber was about 150 ppm, resulting in carboxyhemoglobin levels of 9-11% after 3.5 hr. The monotonous situation was characterized by a uniform repetitive activity, like counting nails; the activating situation by a series of psychomotor tasks, with intervals of listening to music. The critical flicker fusion frequency (CFF) was measured at the beginning of each session and every hour thereafter. Questionnaires were used to record subjective symptoms. The monotonous situation caused a mean decrease of the CFF of 1.8 Hz between the beginning and the end of the session, as well as a significant lessening of subjective symptoms. The activating situation did not influence the CFF or the subjective condition. The CO exposure did not influence the CFF either in the monotonous or the activating situation.

61691 APTIC NO. 80199

Weill, Hans, John Salvaggio, Arthur Neilson, Brian Butcher, and Morton Ziskind

RESPIRATORY EFFECTS IN TOLUENE DIISOCYANATE MANUFACTURE: A MULTIDISCIPLINARY APPROACH. *Environ. Health Perspect., vol. 11:101-108, June 1975. 8 refs.*

The effects of toluene diisocyanate (TDI) vapor inhalation on respiratory health were investigated in a group of exposed workers. Continuous monitoring data on atmospheric TDI concentrations reveal frequent excursions above the threshold limit value of 0.02 ppm ceiling. A number of workers have episodes of acute respiratory symptoms related to single exposure to an irritant gas at work, usually either TDI or phosgene. Pre- and post-shift ventilatory function studies do not indicate significant differences between the exposed and control groups. Selected individuals have carefully controlled inhalation challenge tests to monitored concentrations of TDI vapor under laboratory conditions. In workers suspected of having become sensitized, immediate and/or late air flow obstruction is demonstrated and is related to dose of inhaled TDI. (Author abstract modified)

61692 **APTIC NO. 80279**

Wiester, Mildred J., Rumult Iltis, and Charles T. Pfetzer

A RADIOTELEMETRY SYSTEM FOR MONITORING RESPIRATION IN DOGS. *News Environ. Res. Cincinnati, 4p., Sept. 29, 1975. 9 refs.*

A radiotelemetry system for monitoring respiration in dogs is described. The system consists of two main implantable parts: the sensor and the transmitter. The sensor unit consists of a semiconductor strain-gauge which, when surgically mounted on the dog s rib, detects and converts breathing movement to an output voltage signal. The signal is fed to the transmitting unit and amplified. The transmitted signal is received by a remote frequency-modulated receiver and is subsequently recorded. The strain-gauge signals are calibrated for volume by comparing them with simultaneously recorded direct-volume measurements made with a spirometer. Once calibration curves are constructed, they can be used to estimate volume measurements of subsequent strain-gauge signals.

61693 **APTIC NO. 83586**

Winneke, G. and J. Kastka

OLFACTORY IRRITATION DUE TO AIR POLLUTION. *(Geruchsbelaestigung durch Lufveruneinigungen). Text in German. Praxis Pneumol., 29(7):393-399, 1975. 3 refs.*

The effect of industrial odorous air pollution on the health of the neighboring inhabitants was investigated. A detailed questionnaire was given to 704 inhabitants of Duesseldorf. From a psychosomatic point of view, some persons cannot be regarded as in full health; complete physical, mental, and social well being is no longer attainable.

61694 **APTIC NO. 80313**

Winslow, Jens J. B.

TIME AND CAUSATION IN STUDIES OF LONG-TERM EXPOSURE TO ENVIRONMENTAL FACTORS. *Arch. Environ. Health, 30(8):417-422, Aug. 1975. 7 refs.*

The various shortcomings of the prevalence study as an instrument for causal research are evaluated by comparing the prevalence design with the classical experimental design. Epidemiologists should refine their research strategies in two respects, both related to time. They should include formerly exposed as well as presently exposed subjects in their sampling frames and they should avoid using present status with respect to causal factors as indicators of life experience of these factors. Numerical examples of the undesirable consequences of ignoring time, based on some studies of the relationship between long term exposure to presumed noxae and chronic lung diseases are discussed. (Author abstract modified)

61695 **APTIC NO. 80127**

Wolff, Ronald K., Murna Dolovich, Carol M. Rossman, and Michael T. Newhouse

SULFUR DIOXIDE AND TRACHEOBRONCHIAL CLEARANCE IN MAN. *Arch. Environ. Health, 30(11):521-527, Nov. 1975. 31 refs.*

Tracheobronchial clearance was measured in nine healthy, nonsmoking adults. Technetium Tc 99m albumin aerosol was inhaled as a bolus under controlled conditions to achieve reproducible deposition in large airways. Each subject was studied in three separate 3-hour experiments: twice under control conditions and once exposed to 5 ppm sulfur dioxide. Both deposition and clearance were highly reproducible in individuals in repeat control studies. Acute exposure to 5 ppm SO2 had no signfiicant effect on mucociliary clearance in resting healthy subjects, except perhaps for a small transient change after 1 hr. Pulmonary function tests showed a decrease in maximal midexpiratory flow, but no other significant changes. (Author abstract modified)

61696 **APTIC NO. 76632**

Yakhimovich, N. P.

ODOR THRESHOLD AND REFLECTOR EFFECT ON THE BODY OF SMALL CONCENTRATIONS OF SELENIUM AND TELLURIUM DIOXIDES IN THE AIR. *(O poroge zapakha i reflektornom vliyanii na organizm malykh kontsentratsiy dvuokisi selena i tellura v vozdukhe). Text in Russian. Gigiena i Sanit., no. 2:101-102, 1975. 3 refs.*

Experiments were carried out to determine the odor threshold of selenium and tellurium dioxides, and their effects on the bioelectrical activity of the cerebral cortex. Both the odor threshold and the threshold concentration relative to the effect on the cortical electrical activity were determined to be at the same level (0.2 microgram/cu m) for selenium dioxide. It was not possible to find any odor threshold for the odorless tellurium dioxide, nor any threshold concentration relative to its effect on the cortical electrical activity. A threshold at which inhaled tellurium dioxide causes garlic odor of the breath was found at the 3 microgram/cu m level. The ineffective concentration was determined at 0.1 microgram/cu m for selenium dioxide, and at 1 microgram/cu m for tellurium dioxide.

61697 **APTIC NO. 79797**

Yamaga, M., K. Omori, K. Abe, T. Tozawa, and S. Ochiai

ON THE RESPONSE OF LIVING BODIES EXPOSED TO OZONE AND ACROLEIN AT LOW CONCENTRATION. *(Teinodo ozone oyobi acrolein bakuro no sai no seitai hanno ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):514, Nov. 1975.*

Five healthy men were exposed at first to ozone at 0.3-0.23 ppm and then to a mixture of ozone at 0.3-0.23 ppm and acrolein at 0.15-0.35 ppm for 7.5 min and 17.5 (atmospheric temperature 28-30 C, R.H. 50%). Their circulatory and respiratory functions were determined for the two kinds of exposure while sitting down and while doing knee bends for 80 seconds. Individual response was not consistent; in general, however, rate of respiration showed a tendency of decrease with exposure to the mixture. The change of respiratory and circulatory functions after knee bending exercises in fresh air, in ozone, and in the mixture of acrolein and ozone is given.

61698 **APTIC NO. 76271**

Yamashita, T.

THE STATE OF CONSULTING A DOCTOR OF INHABITANTS IN INDUSTRIAL AREA IN AMAGASAKI CITY PART II. DENTAL DISEASES AND AIR POLLUTION. *(Amagasakishi kogyo chiiki jumin no juryo jokyo ni tsuite Part II. Shika shikkan to taiki osen). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 22(10):406, Oct. 1975.*

Detailed bills for dental consultation and treatment from 12,298 men and 12,693 women in an area of Amagasaki City from April 1964 to March 1965 were analyzed. The data were divided by area of the city into 3 parts: north, middle, and south. The concentrations of sulfur dioxide in these 3 parts were, respectively, 2-3 mg/day/100 sq cm; 2-3 and 3-4 mg/day/100 sq cm; and 3-4 mg/day/100 sq cm (by lead dioxide method). Cases of total dental caries, dental caries accompanying periodontitis, dental caries accompanying periodontitis and pulpitis, total pulpitis, total periodontitis, alveolar abscess, breaking of artificial teeth, dental defects and gingivitis were most frequent in the southern part, followed by the middle part and, most infrequently the northern part. Total dental caries and total pulpitis of women, total periodontitis of both sexes, caries with periodontitis of men and caries with periodontitis and pulpitis of women tended to occur in younger patients from north to south.

61699 **APTIC NO. 83058**

Yamashita, Takaaki, Atsushi Matsushima, Nobuo Kawamoto, Hiroshi Miyawaki, Kiyoyasu Moriya

RELATIONSHIP BETWEEN NASAL ALLERGY AND ASTHMA OF CHILDREN IN HIROSHIMA CITY. *(Hiroshima jido no hana-arerugi to zensoku to no kanrensei ni tsuite). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 28(11):1237-1242, Nov. 1975. 7 refs.*

The Environmental Pollution Control Committee of the Hiroshima Medical Society and the Hiroshima Mitsubishi Hospital made a joint effort to investigate the relationship between nasal allergies and asthma among ten primary schoolchildren of Hiroshima in 1974. Children (533) with an allergic constitution were selected for an examination to accurately assess nasal allergy and asthma. The test method, standards for judgement of nasal allergy, results of the examinations, manifestations of asthma among lower and higher grade children with a nasal allergy, manifestations of asthma among boys and girls with a nasal allergy, and the relations of various examined factors among children with both a nasal allergy and asthma are reported. The objective of this basic investigation was to study the effect of air pollution on the upper and lower respiratory passages. The investigation revealed an upward trend of respiratory allergies among children.

61700 **APTIC NO. 80063**

Yazaki, K. and F. Tsunoda

MORIDITY OF CHRONIC OBSTRUCTIVE PULMONARY DISEASES NOTIFIED BY PHYSICIANS. *(Ishi no todokede ni yoru mansei heisokusei hai-shikkan no yubyoritsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):489, Nov. 1975.*

The incidence of patients suffering chronic bronchitis (BRO), bronchial asthma (AST) and pulmonary emphysema, identified by medical organizations in Iwate Prefecture during September 1974, was analyzed by locality, sex and age. The number of patients with obstructive pulmonary disease (COLD) was relatively small (4297 out of a total population of 1.36 million). Cases of AST were 83.3% of total COLD, and cases of BRO were only 14.3% of total COLD. These ratios differed from those found in air-polluted areas. Air pollution in Iwate Prefecture is the lowest in Japan.

61701 **APTIC NO. 83240**

Yoda, H.

EFFECT OF LONG-TERM EXPOSURE OF SULFUR DIOXIDE AT LOW CONCENTRATION ON THE RESPIRATORY SYSTEM OF MOUSE. *(Teinodo aryusangas chokiboro no mausu kokyuki ni oyobosu eikyo). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), 13(7):403-411, 1975. 22 refs.*

Groups of dd-strain female mice were continuously exposed to sulfur dioxide at 0.05, 0.15 and 0.23 ppm for 6-month and 3-month periods. There were 8 mice in the first group and 24 in the second group. There was no difference in body weight increase between the exposed groups and the control. Although there were 3 deaths in the exposed groups and none in the control, there was no difference in mortality between the 3 exposed groups. Goblet cell changes on the respiratory epithelium of the naval cavity of 80% of exposed mice were observed. Disorder and a 44% decrease of cilia was seen. No conspicuous difference was seen between the exposed group and the control in the trachea, bronchi, and lungs. The frequency of bronchitis and pneumonia showed no difference between control and exposed animals. No correlation between the goblet cell changes of nasomucosal epithelium and diseases of the bronchii and the lungs such as bronchitis and pneumonia was found. The exposure of sulfur oxide by itself and at low concentrations did not cause pathomorphological change in the nasal mucosa.

61702 **APTIC NO. 79621**

Yokoyama, E., H. Goto, and S. Nagaoka

EFFECT OF SULFURIC ACID MIST ON RESPIRATORY FUNCTION ON SMALLER ANIMALS. *(Ryusan mist no shodobutsu deno kokyukino eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):477, Nov. 1975.*

Groups of male S.P.F. Wistar rats were pre-exposed to air for 30 min, then exposed to sulfuric acid mist for one hour and then after-exposed to air for one hour. Two concentrations of sulfuric acidd mist were used: 1-24 mg/cu m and 50-127 mg/cu m. The values determined were f, TV, Ve, respiratory resistance (RI), lung compliance (CI), heart rate, pressure-volume relationship of the removed lung, and moisture content of the the lung. During exposure to sulfuric acid mist, TV was higher for low mist concentrations and lower for high concentrations; f was lowest for high concentrations, and lower than the control group for low concentrations; RI was higher for both concentrations; CI was lower for both concentrations. No conspicuous change was seen in heart rate and moisture content of the lung. The mist-exposed lung showed the coloration of a hyperemic lung, with spotlike bleeding and much secretion in the trachea.

61703 **APTIC NO. 82264**

Yoshida, A., K. Hayashi, and T. Motomiya

EXPERIMENTAL STUDIES ON THE EFFECT OF AIR POLLUTION ON THE ONSET OF BRONCHIAL ASTHMA PART 2. *(Taiki-osen no kikanshizensoku hassho ni oyobosu eikyo ni kansuru jikkenteki kenkyu). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 22(10):411, Oct. 1975.*

Changes in the production of reagin antibody in rats due to exposure to nitrogen dioxide and ozone were studied. Female Wistar rats were exposed to nitrogen dioxide at 10 ppm for 5 hr/day and to ozone at 1 ppm for 3 hr/day, and then after being intraperitoneally injected with Bordetella Pertussis vaccine (as an adjuvant) they were sensitized by inhalation of 10% egg-white albumin for 10 minutes. The rats were divided into 10 groups according to the times of sensitization, the times of adjuvant injection and the times of exposure to nitrogen dioxide or ozone. The production of reagin antibody and hemagglutinin (HA) were examined for each group. It was found that although the adjuvant injection was necessary to produce reagin antibody the exposure to nitrogen dioxide or ozone (especially nitrogen dioxide) increased the production.

61704 **APTIC NO. 80084**

Yoshida, K.

ENVIRONMENT POLLUTING SUBSTANCES AND THEIR EFFECTS, FROM THE STANDPOINT OF EPIDEMIOLOGY. *(Kankyo osen busshitsu to sono eikyo, ekigaku no tachiba kara). Text in Japanese. Preprint, Japan Pharmaceutical Assoc., Tokyo, p. 9-14, 1975. (Presented at the Environment Polluting Substances and their Toxicology Symposium, 2nd, Gifu, Japan, Oct. 28, 1975.)*

The meaning of epidemiology, the reasons for its prominence, and the relationship of the perspective of epidemiology to that of other sciences are reviewed. Epidemiology's ability to identify potential pollution hazards is described. The tracing of the tie between asthma and air pollution is described in detail. The hypersensitivity of the airway caused by the simultaneous inhalation of nitrogen monoxide and nitrogen dioxide, and the effects of antigens are explained. Epidemiological etiology, the four principles of epidemiology, the definition of problems in environmental pollution, and the relationship between environmental pollutant standards and epidemiology are described.

61705 **APTIC NO. 72828**

Illinois Inst. for Environmental Quality, Chicago, Environmental Health Resource Center

ADVISORY REPORT ON THE HEALTH IMPLICATIONS OF THE CATALYTIC CONVERTER. *Rept. 75-09, EHRC 13, 46p., Feb. 1975. 55 refs.*

The health implications of using catalytic converters for the control of automobile exhaust emissions are reviewed. Although catalytic converters substantially reduce hydrocarbons, carbon monoxide, and nitrogen oxides, as well as the formation of ozone possibly, they nevertheless result in the emission of sulfuric acid and spent catalytic material like platinum and ruthenium. The toxic effects of sulfur particulates are well established in contrast to the sparse amount of knowledge on the effects and fate of materials like platinum, palladium and ruthenium. Studies with bacteria, however, indicate that such metals can significantly alter the growth of Escherichia coli. Although converters preclude the use of lead in gasoline and thus indirectly result in less airborne lead emissions, the replacement for lead in gasoline is manganese which is also highly toxic and serves as a catalyst facilitating the formation of sulfuric acid.

61706 **APTIC NO. 76160**

Environmental Protection Agency, Research Triangle Park, N. C., Criteria and Special Studies Office

ANNUAL CATALYST RESEARCH PROGRAM REPORT. APPENDICES, VOLUME VI (ANNUAL REPORT). *Program Element 1AA002, Rept. EPA-600/3-75-010g, 291p., Sept. 1975. 169 refs.*

An appendix dealing with the toxicology of catalyst-generated motor vehicle emissions is presented as part of the annual report of the Environmental Protection Agency s Office of Research and Development Catalyst Research Program. Specific topics covered include: the effect of sulfuric acid on the deposition of radioactive aerosol in the respiratory tract of guinea pigs, the effect of sulfuric acid aerosol on the clearance of streptococci from the mouse respiratory tract, ammonium and sulfate ion release of histamine from lung fragments, the toxicity of platinum and palladium, the analysis of rat tissue for platinum, manganese, and lead content, the use of selected assays of nucleic acid and protein synthesis for assessing the toxicity of emissions resulting from fuel additives, the use of a mouse infectivity model to determine no-effect levels of platinum metal compounds, the exposure of tissue culture systems to air pollutants under conditions simulating physiologic states of lung and conjunctiva, the use of pulmonary macrophages as indicators of the effect of inhalation of platinum, lead, and other base metal compounds, the comparative pulmonary carcinogenesis of platinum and lead compounds in association with polynuclear aromatics using an in vivo hamster system, and the methylation chemistry of platinum, palladium, lead, and manganese.

61707 **APTIC NO. 76161**

Environmental Protection Agency, Research Triangle Park, N. C., Criteria and Special Studies Offfce

ANNUAL CATALYST RESEARCH PROGRAM REPORT. APPENDICES, VOLUME VII (ANNUAL REPORT). *Program Element 1AA002, Rept. EPA-600/3-75-010h, 279p., Sept. 1975. 46 refs.*

An appendix dealing with toxicology and atmospheric interaction of catalyst-generated motor vehicle pollutants is presented as part of the annual report of the Environmental Protection Agency s Office of Research and Development Catalyst Research Program. Specific topics covered include: animal exposure studies of the toxicity of platinum, palladium, lead, and manganese compounds as well as sulfate compounds; diffusion modeling involving line sources and highways; methods for determining the effects of fuels and additives on atmospheric visibility; methods for the collection and analysis of sulfuric acid and sulfates; personal exposure meters for suspended sulfates; smog chamber studies of SO2 photooxidation to sulfate under roadway conditions; studies of the scavenging of SO2 and sulfates by surfaces near roadways; and the characterization of roadside sulfate-containing aerosols in the St. Louis and Los Angeles areas.

61708 **APTIC NO. 76163**

Environmental Protection Agency, Research Triangle Park, N. C., Criteria and Special Studies Office

ANNUAL CATALYST RESEARCH PROGRAM REPORT. APPENDICES, VOLUME IX (ANNUAL REPORT). *Program Element 1AA002, Rept. EPA-600/3-75-010j, 280p., Sept. 1975. 78 refs.*

An appendix dealing with impact of catalyst-generated exhaust emissions on human health is presented as part of the annual report of the Environmental Protection Agency s Office of Research and Development Catalyst Research Program. Specific topics covered in the appendix include: an update of the health effects of sulfates, the development of analytical techniques for measuring human exposure to fuel additives, the design of procedures for monitoring platinum and palladium, trace metals in occupationally and non-occupationally exposed individuals, an evaluation of analytical methods for platinum and palladium, a literature search on the use of platinum and palladium, and a work plan for obtaining baseline levels of platinum and palladium in human tissue.

61709 **APTIC NO. 76217**

Environmental Protection Agency, Research Triangle Park, N. C., Office of Research and Development

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON PARTICULATE POLYCYCLIC ORGANIC MATTER (FINAL REPORT). *Program element 1AA001, Rept. EPA-600/6-75-001, 96p., March 1975. 210 refs.*

Current knowledge of particulate polycyclic organic matter in the environment is reviewed and evaluated with respect to possible deleterious effects on human health and welfare. Sources, distribution, measurement, and control technology are also considered. Results of an extensive literature search are presented. Experiments have shown a number of polycyclic organic compounds to be carcinogenic in animals. Although these same compounds have not been proven to be carcinogenic in humans, evidence strongly suggests they may contribute to the urban factor. The urban lung cancer death rate in American males is about twice the rural rate, even after adjustment for differences in smoking habits. Evidence suggests significant differences between specific urban areas across the United States. The bulk of the available data is in terms of benzo(a)pyrene; so this compound has been used as an index on particulate polycyclic organic matter. Average seasonal concentrations of benzo(a)pyrene in the ambient atmosphere range from less than 1 ng/cu m in nonurban areas to a maximum of 50 ng/cu m. (Author abstract)

61710 **APTIC NO. 80346**

OZONE IN SMOG. *Lancet, 2(7944):1077-1078, Nov. 29, 1975. 24 refs.*

Ozone concentrations as low as 1 ppm can cause upper respiratory tract irritation, headache, and chest pain, while dyspnoea, delayed pulmonary edema, and hemorrhage are serious complications of excessive exposure to ozone. Relatively low ozone exposure may give rise to respiratory infections, secondary damage to alvolar macrophages, and impairment of phagocytosis. Rats fed diets with or without vitamin E were exposed to ozone. Vitamin E deficiency made the rats more susceptible to lung damage from ozone but reduction in bactericidal activity in the lungs was not uniform: in brief exposures there was no reduction. Vitamin E prevents the production of Heinz body inclusions in human red cells by methyloleate ozonide. Exposure of mice to 2.5 ppm ozone for 120 days resulted in decreased synthesis of DNA and RNA in lung tissue and an increase in protein synthesis. Concentrations of nitrogen dioxide in smog are not high enough to give serious concern. However, the combined effect of ozone and nitrogen dioxide is equivalent to that of each of them independently. Exposure to 0.75 ppm ozone for 4 to 8 hours was insufficient to cause clinical abnormality in the parathyroid gland of rabbits; nevertheless, there were considerable changes. Experiments with simulated smog show that human sensitivity to ozone varies widely. Studies show a significant correlation between exposure to ozone and increased airway resistance. Low concentrations of ozone and sulfur dioxide inhaled together have a much greater effect than either separately; there is considerable individual variation.

61711 **APTIC NO. 80353**

Center for Disease Control, Atlanta, Ga., Environmental Health Services Div.

INCREASED LEAD ABSORPTION AND LEAD POISONING IN YOUNG CHILDREN. *J. Pediat., 87(5):824-830, Nov. 1975. 28 refs*

The screening, diagnosis, and treatment of children with increased lead absorption and Pb poisoning are discussed. All children of 1-5 yr who live in, or frequently visit, poorly maintained housing units constructed prior to the 1960 s should be screened at least once a year. Screening tests are essentially limited to various methods of blood Pb determination and measurement of erythrocyte protoporphyrins (EP). Elevated levels of EP (60-189 microgram/dl) may be due to iron deficiency anemia, but extremely elevated levels (more than 190 microgram/dl) are due almost exclusively to Pb intoxication. If screening tests indicate a child needs further evaluation, whether symptomatic or not, several diagnostic tests are readily available to the clinician. Pediatric management of Pb poisoning includes appropriate treatment and adequate follow-up. Chelation therapy is indicated for some children with undue Pb absorption. The optimal frequency of follow-up visits is dependent on many factors, including the child s age, status of housing, trend of laboratory results, and parental resources available.

61712 **APTIC NO. 82101**

Tokyo Metropolitan Government, Meguro Ward Office

EFFECTS OF AIR POLLUTION ON HUMAN BODY. *(Taikiosen ga jintai ni oyobosu eikyo). Text in Japanese. In: Environmental Pollution Survey in 1974, p. 3-30, 1975.*

The effects of air pollution on the health of inhabitants of Meguro Ward was studied in patients who visited physicians in the Ward in July and Nov. 1974. Patients who were suffering from bronchial asthma, asthmatic bronchitis, pulmonary emphysema, and lung cancer were more precisely medically examined three times annually. This survey was begun in 1968 and is performed yearly. The frequency of occurrence of these diseases, the increase of patients suffering from them, and the percentage of patients with these diseases out of the total number of patients who visited physicians were a little larger in highly polluted areas than in less polluted areas; however, as air pollution is spreading throughout the city, the difference could not be numerically determined.

61713 **APTIC NO. 83178**

STUDIES OF THE EFFECTS OF ENVIRONMENTAL POLLUTION ON HUMAN BODY PART 1. STUDIES ON THE EFFECTS OF PHOTOCHEMICAL SMOG ON HUMAN BODY. *(Kogai no jintai eikyo ni kansuru kenkyu 1. Kokagaku smog no jintai eikyo ni kansuru kenkyu). Text in Japanese. Osaka Furitsu Koshu Eisei Kenkysho Nenpo (Annu. Rept. Osaka Prefect Inst. Pub. Health), vol. 1974:65, 1975.*

A study of acute injury, using 1800 mice, found that oxidant has different effects than ozone on body temperature and leukocyte abnormality. Measures for preventing photochemical smog damage should not be based on research on ozone alone. It is necessary to consider the composite action of all components of photochemical smog. A study of chronic injury investigated pulmonary pathohistological changes in mice exposed daily to low concentrations of photochemical oxidant (0.1-0.5 ppm for 2-3 hr for 3 months) to find pulmonary degeneration such as flattening and atrophy of bronchial epithelial cells, round cellular infiltration around bronchioles, and proliferation of collagen fibers. These changes lead to obstructive respiratory diseases and to pulmonary progeira.

61714 **APTIC NO. 83180**

Kure Municipal Government

RESULTS OF THE SURVEY ON HEALTH AS THE EFFECT OF LEAD IN AUTO EXHAUST. *(Jidosha haishutsugaschu no namari ni kakaru kenkochosa). Text in Japanese. In: Present State and Problems of Environmental Pollution, 4th Rept., p. 38-39, 1975.*

The health effects of lead in auto exhaust have been investigated yearly since 1970. The results of a survey of housewives between age 30 and 60 who had lived more than one year in Kure are given. The subjects were grouped by their residence in either busy motor traffic areas and in areas of less motor traffic. Lead in blood and urine, hematocrit%, protein, and specific gravity of serum, specific weight of blood, hemoglobin content, and basophilic erythrocytes were measured. No person was intoxicated by lead, but 9 of 130 showed anemia.

61715 **APTIC NO. 83183**

STUDIES OF THE EFFECTS OF ENVIRONMENTAL POLLUTION ON HUMAN BODY PART 2. STUDIES OF THE EFFECTS OF NITROGEN MONOXIDE ON HUMAN BODY. *(Kogai no jintaieikyo ni kansuru kenkyu 2. Issanka chisso no jintai eikyo ni kansuru kenkyu). Text in Japanese. Osaka Furitsu Koshu Eisei Kenkyusho Nenpo (Annu. Rept. Osaka Prefect. Inst. Pub. Health), vol. 1974:65, 1975.*

The chronic effects of nitric oxide on mice and a technique of determining NO-hemoglobin in human blood were studied. After exposing mice to nitric oxide at 10 ppm for 6-5 months continuously, it was found that WBC increased, ChE activity decreased, the weight of the lungs and spleen increased, and pathohistological change occurred in the lungs. A method of determining NO-hemoglobin in animal blood by electron spin resonance was tried on the blood of human volunteers, and it was found that there is a difference of electron spin resonance behavior between animal blood and human blood.

61716 **APTIC NO. 83191**

ENVIRONMENTAL SANITATION: HEALTH DISTURBANCE DUE TO SEVERAL POLLUTANTS; EFFECTS OF AIR POLLUTION. *(Kankyo Hoken: Kakushu osenbutsushitsu niyoru kenkohigai; Taikiosen no eikyo). Text in Japanese. Fukushi No Tokei (Health Welfare Stat.), 22(9):238-239, 1975.*

Respiratory diseases concerning air pollution are chronic bronchitis, bronchial asthma, pulmonary emphysema, asthmatic bronchitis, pulmonary fibrosis and cor pulmonale. Air pollutants such as floating dust and sulfur oxides are related to chronic bronchitis and bronchial asthma, and manganese and beryllium in floating dust possibly cause pneumonia and pulmonary fibrosis. Lead in auto exhaust may cause lead intoxication and 3,4-benzpyrene and benzo-b-fluoranthene are carcinogenic in bronchial mucosa. The symptoms of acute effects are seen in photochemical smog. The effects of chronic exposure to air pollutants appear not only on the respiratory system but also on the circulatory system. The effects of auto exhaust are described in detail. The total number of officially reported victims of photochemical smog was about 134,000 from June 1970 (the first occurrence)to 1974.

61717 **APTIC NO. 83192**

RESULTS OF SURVEY ON HEALTH EFFECTS OF COMBINED AIR POLLUTION, 1974. *(Showa 49 nendo, fukugotaikiosen kenko eikyo chosa). Text in Japanese. In: Environmental White Paper in 1975, p. 111-117, 1975.*

The results of survey conducted since 1970 the health effects of air pollution on 346 women from age thirty to sixty and 88 men in their sixties in Omuta City, and 370 women and 85 men in the same age range in Fukuoka City are given. Measured values of pollutants are also given. The highest positive response to a questionnaire concerning respiratory symptoms was for sputum, followed by coughing, coughing and sputum, and stridor. In both cities the percentage of disturbance of pulmonary function was high; 15.4% in Omuta and 9.3% in Fukuoka. Lead in urine, delta-aminolevulinic acid, and coproporphyrin averaged 4.7 microgram/l, 1.2 mg/l, and 46 microgram/l respectively in 40 persons in Omuta and 5.5 microgram/l. 1.3 mg/l, and 40 microgram/l in 51 persons in Fukuoka. The incidence of positive urinoprotein and crinosugar was 11.1% and 1.6% respectively in Omuta, and 6.1% and 2.7% in Fukuoka.

61718 **APTIC NO. 83252**

Kanagawa Prefecture Environmental Center

STUDIES OF THE EFFECTS OF SUBSTANCES THAT CAUSE PHOTOCHEMICAL DAMAGE TO ANIMALS. *(Kokagaku kogaibusshitsu no dobutsu ni oyobosu eikyo no kenkyu). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.), no. 7:31-32, Dec. 1975.*

Effects of combined pollutants in photochemical smog on rabbits were experimentally studied. The combinations of pollutants were ozone and acrolein, and ozone and a nitric acid ester. The results showed that the combination of ozone and acrolein clearly had a synergistic action causing severer respiratory and circulatory symptoms than for either component alone; however, the combination of ozone and the nitric acid ester did not have such an action. These findings suggest a large role for acrolein in the presence of oxidants and nitrogen oxides in causing photochemical environmental damage.

61719 **APTIC NO. 83379**

Tokyo Metropolitan Assoc. of Pharmacists and Tokyo Metropolitan Assoc. of School Pharmacists

RESULTS OF THE SURVEY OF AIR POLLUTION AFFECTING SCHOOLCHILDREN (BOYS AND GIRLS). *(Gakko ni oyobosu taikiosen chosa). Text in Japanese. 57p., Nov. 1975.*

The results of a survey on air pollution in Tokyo Metropolis during the past 3 years are given. Observed values of air pollutants such as sulfur oxides, nitrogen oxides, and their change with wind direction are described. Measurements were obtained in 30 primary and middle schools distributed in Tokyo Metropolis. Subjective symptoms were investigated by questioning children in the schools. There were clear differences in the state of air pollution between the Metropolis and other areas (cities, towns and villages). The number of children feeling abnormal body conditions was larger in the 23 Wards than in the other parts. The complaints of cough were most frequent in October and least frequent in July in the Wards, while complaints of dullness were most frequent in July and less frequent in October. In areas other than the Wards, the frequency of complaints of eyeache, eye prick and headache was relatively large, especially from 11 am to 2 pm. According to the inquiries in Oct. 1974, there had been a conspicuous reduction of health impairment for schoolchildren. The frequency of such reports were greater in the Wards than in less urban areas. Damage occurred where concentrations of sulfur trioxide and nitrogen dioxide were higher.

61720 **APTIC NO. 83680**

CYTOTOXICITY OF PHOTOCHEMICAL OXIDANT. *(Kokagaku oxidant no saibodokusei). Text in Japanese. Osaka Furitsu Koshueisei Kenkyujo Nenpo (Annu. Rep., Osaka Pref. Inst. Pub. Health), vol. 1974:23-24, 1975.*

To test the toxicity of ozone and photochemical oxidant with respect to cell immunological responses, Dutch male stock rabbits were exposed to ozone, oxidant, and auto exhaust. The interferon production of the alveolar macrophages of the exposed rabbits decreased after 3 hr of exposure to 1 ppm of ozone, and ceased after 3 hr of exposure to 3 ppm of ozone, showing the greater sensitivity of Dutch stock rabbits, compared to common rabbits. The interferon production of the alveolar macrophages of the Dutch stock rabbits exposed to oxidant for 3 hr ceased, and was reduced after 3-hour exposure to auto exhaust. Protein synthesis of the alveolar macrophages exposed to oxidants showed the same response as interferon. The sensitivity of interferon production was larger than that of protein synthesis.

61721 **APTIC NO. 83683**

Kure Municipal Government

RESULTS OF HEALTH EXAMINATION CONCERNING PULMONARY EFFECTS OF AIR POLLUTION. *(Taikiosen no kokyuki ni oyobosu kenko chosa). Text in Japanese. In: Present State and Problems of Environmental Pollution in Kure City, 4th Report, p. 35-36, 1975.*

An investigation, started in 1969, of the effects of air pollution on the respiratory system in Kure City is reported. Three areas of investigation were selected: 580 female inhabitants older than 40 were given a questionnaire based on BMRC, pulmonary function tests, blood pressure tests and chest roentgenography. The morbidity of pulmonary disease symptoms for coughing, sputum, gasp, asthma, and nasal catarrh, was found. The combined symptoms were relatively low in frequency, except for smokers. Coughing during day and night, increase of coughing and sputum, asthma, and nasal catarrh showed differences, and the three symptoms showed higher morbidity in more air polluted areas suggesting the effect of air pollution. No relationship was found between vital capacity during exercise, one-second rate, and air pollution.

61722 **APTIC NO. 83705**

Himeji Municipal Health and Nuisance Office and Himeji City Medical Assoc.

RESULTS OF INVESTIGATION ON CHRONIC BRONCHITIS, ASTHMATIC BRONCHITIS, ASTHMA AND LUNG CANCER BY DETAILED DEMAND BILLS OF NATIONAL HEALTH INSURANCE. *(Kokumin kenko hoken seikyu meisaisho ni yoru taisho shitsubyo chosa). Text in Japanese. In: Investigation Of Effects Of Air Pollution On Human Health In Himeji, 1974, p. 33-41, 1975.*

National health insurance claims for 4 areas of Himeji City (coastal, old city, and two rural areas) for April, June, Aug., Oct., and Dec. 1974 and Feb. 1975 were used to study the morbidity of diseases among the insured people. The total number of insured was 24,364. The morbidities of chronic bronchitis, asthmatic bronchitis and asthma were 0.26 (0.31), 0.46 (0.46), and 0.48 (0.39), respectively (the parenthetical figures are the morbidity in 1973). The morbidity of chronic bronchitis and asthmatic bronchitis was highest in the coastal area; that of asthma was highest in old city area. Morbidities of asthmatic bronchitis and asthma were lowest in a rural control area. These results differ from results obtained by the Himeji Medical Association for the relative morbidity of different areas.

61723 **APTIC NO. 83857**

Himeji Municipal Health and Nuisance Office and Himeji City Medical Assoc.

SURVEY ON THE MORBIDITY OF SPECIFIED DISEASES MONITORED BY HIMEJI CITY MEDICAL ASSOCIATION. *(Honhaikaiin o monitor tosuru honshijumin no tokutei shikkan yushoritsu chosa). Text in Japanese. In: Report on the Investigation of the Effect of Air Pollution in Himeji (1974), p. 12-13, 1975.*

The morbidities of chronic bronchitis, asthmatic bronchitis, asthma, and lung cancer were investigated from April 1, 1974 to March 31, 1975 on 685 patients in a coastal zone, an older city, and two agricultural zones of Himeji City. In general, the trend of morbidities was the same as that obtained in the past 5 years. The morbidity of chronic bronchitis was higher in the older city. Asthmatic bronchitis and asthma were higher in the coastal zone. The morbidity of chronic bronchitis was higher in those without occupations, those engaging in housework and field work. That of asthmatic bronchitis was higher in infants. The morbidity of chronic bronchitis increased with age, the morbidity of asthmatic bronchitis and asthma was high in infants and decreased and then increased with age. Lung cancer appeared mainly in citizen older than 50.

61724 **APTIC NO. 83947**

DAMAGE DUE TO AIR POLLUTION AND ITS COUNTERMEASURE. *(Taikiosen ni kakawaru higai to taisaku). Text in Japanese. In: Chiba Prefectural Environmental White Paper (1975), p. 325-335, 1975.*

The aid and relief afforded patients suffering from environmental pollution in Chiba Prefecture are described. The numbers suffering from photochemical smog were 1169, 561, 164, 238, and 277, in 1971, 1972, 1973, 1974 and 1975, respectively. This variation showed correlation to the oxidant concentration. The major subjective symptoms were transient pain in the eyes and throat. On July 3, 1974, an acidic rain fall injured 38 persons.

61725 **APTIC NO. 84079**

EFFECTS OF AIR POLLUTION ON HUMAN HEALTH. *(Taikiosen ni yoru kenko eikyo). Text in Japanese. In: Fukushima Prefectural Environmental Pollution White Paper (1975), p. 396-403, 1975.*

The results of a health survey of inhabitants of the Iwaki and Bankai areas in Fukushima Prefecture, carried out from June to Nov. 1974, are described. Complaints of subjective symptoms, the results of lung function examinations and the results of chest roentgenographic examination are given. In subareas in the two areas, the effects of air pollution on human body could not be identified. No change was detected from results of a similar study in 1973.

61726 **APTIC NO. 84096**

Kure City Medical Assoc.

RESULTS OF THE SURVEY OF ASTHMATIC DISEASES IN PRIMARY SCHOOLCHILDREN. *(Shogakko jido no zensokuchosa). Text in Japanese. In: Present State and Problems of Environmental Pollution, 4th Report, p. 36-37, 1975.*

The present state of asthmatic diseases and the effects of air pollution on asthmatic diseases in children in Kure City have been surveyed since 1972. The results of a survey of 4844 children in 8 primary schools in 1974 are given. Screening and precise medical examination were conducted. Cases of bronchial asthma numbered 73, and cases diagnosed as being in the remission state of bronchial asthma numbered 16. Adding 5 cases of suspected bronchial asthma, the total number of children suffering from bronchial asthma was 94 (1.8%). The ratio of boys to girls was 1.54 to 1. The frequency of the disease was higher in center city than in the outskirts.

61727 **APTIC NO. 84157**

RESULTS OF SURVEY OF SCHOOLCHILDREN S AIRWAY DISEASES IN FUNABASHI CITY. *(Funabashi-shi ni okeru gakudo no kido-shikkan chosa). Text in Japanese. In: Report on Environmental Pollution in Funabashi City (1975), p. 5, 1975.*

Airway diseases were surveyd in 6709 primary schoolchildren in 5 schools in Funabashi in 1975. The survey has been annual since 1970. First, 326 children were questioned concerning asthmatic diseases; 173 children were selected by taking detailed disease histories. The number of asthma patients was 125, (a morbidity of 1.9%, compared to 2.5% in 1974). The morbidity was higher in younger children, decreasing as age increased.

61728 **APTIC NO. 84158**

RESULTS OF MORBIDITY SURVEY ON RESPIRATORY DISEASES IN FUNABASHI CITY. *(Funabashi-shi ni okeru kokyuki shojo yushoritsu chosa). Text in Japanese. In: Report on Environmental Pollution in Funabashi City (1975), p. 6, 1975.*

The morbidity of respiratory diseases of the inhabitants in Funabashi City, especially those living within a radius of 500 m from automatic air pollution detectors was studied. The number of people selected was 700. They were examined by questionnaire (based on the BMRC) and by chest roentgenography.

61729 **APTIC NO. 84523**

Suita Municipal Office

RELIEF OF THE POLLUTION-RELATED PATIENTS IN SUITA CITY. *(Kogai kenko higaisha no kyusai). Text in Japanese. In: A White Paper on Environmental Pollution in Suita City (1974), p. 213-227, 1975.*

A BMRC survey in 1974 of 690 randomly selected persons residing in Suita city for more than 3 years was carried out on people between ages 40 and 60. The morbidity of continued coughing was 14.5% (20.5% in males and 8.9% in females); that of continued sputum was 22.5% (30.4% in males and 15.1% in females); that of continued coughing and sputum was 11.3% (15.7% in males and 7.3% in females); and that of chronic bronchitic symptoms was 3.2% (3.6% in males and 2.8% in females). Spiroscopic examination of 601 persons out of the 690 showed that all the values of vital capacity, one-second volume, and one-second rate were lower in females than in males, and lower in the fifties than in the forties for males and females. The southern part of Suita City has been officially appointed as a region where special compensation is given for patients whose diseases are related to environmental pollution.

1974

61730 **APTIC NO. 70545**

Basmadshijewa, K.

CHANGES OF THE CONTENT OF HAPTOGLOBIN AND SERUM MUCOIDS IN ANIMALS WHICH WERE TREATED BY APPLYING SOME CHEMICAL SUBSTANCES. *(Veraenderungen des Gehaltes an Haptoglobin und Serummukoiden bei Tieren, die mit einigen chemischen Stoffen behandelt wurden). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 20(9):584-586, 1974.*

For determination of the changes of the content of haptoglobin and serum mucoids under the influence of pharmaceuticals such as cortisone and apamine, of air pollutants such as dust, sulfur dioxide, silica, lead, arsenic, copper and zinc aerosols, of aqueous extracts from toys, as well as of 2 mg ammonia/cu m and 0.1 mg phenol/cu m, experiments with 240 albino rats were performed according to the method of Jayle. The copper melting combine G. Damjanow in the city of Pirdop, Bulgaria emits all the above mentioned air pollutants. Exposure of rats to the natural conditions prevailing in the neighborhood of this plant revealed the following changes of biochemical parameters: increased discharge of delta-aminolevulinic acid in the urine, decrease of the sulfhydryl groups in serum, and decrease of catalase, peroxidase, and cytochrome oxidase activity in liver. Three-month exposure to the air pollutants emitted by the copper melting combine yielded a reduction of both haptoglobin and serum mucoids.

61731 **APTIC NO. 80173**

Bederka, J. P., Jr. and J. S. McLellan

DEVELOPMENTAL EFFECTS OF LEAD. *In: Survival in Toxic Environments. M. A. Q. Khan and John P. Bederka, Jr. (eds.), New York, Academic Press, 1974, p. 515-520.*

The development effects of lead in humans and mice are reviewed. Sublethal concentrations of Pb alter the development of children less than the socioeconomic factors controlling the environment. Levels of blood Pb below 60 micrograms/100 ml are without effects on the population, since chelation therapy is usually begun only at Pb concentrations higher than 60 microgram/100 ml. Relatively high levels of Pb entering the fetal and neonatal mouse via the maternal route result in microscopic teratogenic effects and decreased fetal birth weight in mice. Effects on postnatal development in the form of increased mortality, slower rate of body weight gain, and depressed gross motor activity are seen during the first 35 days of life in mice. (Author summary modified)

61732 **APTIC NO. 82504**

Carnow, Bertram W.

PREDICTIVE MODELS FOR ESTIMATING THE HEALTH IMPACT OF FUTURE ENERGY SOURCES. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 313-331. 4 refs. (June 24-28.)*

Decisions regarding future energy usage depend on several major parameters, including the health effects produced by the energy source used. The types of studies needed to increase the data base required to predict these effects are discussed. Results of a study examining visits to the emergency rooms in 18 major hospitals in Chicago during 24 hr on the same day of the week that was carried out for 18 mo are presented. Documentation of all admissions to the emergency rooms for cardiac, respiratory, and other diseases was maintained; and levels of various air pollutants at the hospital and in the area of the residence from which the patients came to the hospital were evaluated. These relationships and their effect on the cardiopulmonary system were examined. Use of these results in a model predicting the health impact of changes in energy use and pollution is discussed. The model is based on the concept of a continual dose-response relationship between air pollutants and health, and requires definition of various high risk categories in the population. By quantitative definition of differences in disease rates at low and high pollution levels in high risk individuals, and determination of the total numbers of these individuals in the population, the numbers that are affected at varying levels of pollution can be ascertained. The excess numbers of asthmatic attacks 455,000/quad, and acute respiratory illness is preschoolchildren, 120,000/quad, which might be expected to occur, suggest that increases in energy use may vary significantly affect the health of large segments of population. (Author abstract modified)

61733 **APTIC NO. 82093**

Chapman, R., J. French, J. Finklea, and H. Goldberg

DOSE-RESPONSE RELATIONSHIPS LINKING SHORT-TERM AIR POLLUTION EXPOSURES TO AGGRAVATION OF CARDIO-RESPIRATORY ILLNESS. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 193-229. 13 refs. (June 24-28.)*

Two epidemiologic studies, one in metropolitan New York and one in Utah s Salt Lake Basin, investigated the effect of daily pollution changes on asthma attack frequency in children and adults. A third, in the New York area, investigated the effects of such changes in groups of elderly patients with combined cardiopulmonary disease. All subjects maintained symptom diaries for about 8 mo. About 200 elderly patients and 359 asthmatics participated. The Salt Lake Basin s major pollutants are suspended sulfates and sulfur dioxide from a copper smelter. Outdoor temperature there showed a negative correlation with asthma attack rates, obscuring pollutant effects on subfreezing days. Attack rates increased consistently with total suspended particulate (TSP) levels on days of minimum temperature between 30 and 50 F, and with both TSP and suspended sulfate (SS) levels on days of minimum temperature above 50 F. It was estimated that excess attacks could be expected above 17.4 microgram SS/cu m for days of minimum temperature between 30 and 50 F, and at 1.4 microgram/cu m for warmer days. The estimated thresholds in New York were 7.3 microgram/cu m on days of minimum temperature above 50, and 12 microgram/cu m on cooler days. Temperature and pollution effects on asthma attack rates were generally weaker in New York. Pollution effects on cardiopulmonary symptoms were slightly stronger on cold days. It was estimated that excess symptom rates could be expected above 9.2 microgram SS/cu m for days of minimum temperature between 20 and 40 F. The threshold could not be reliably estimated for warmer days. (Author abstract modified)

61734 **APTIC NO. 82341**

Clayton, J. Wesley, Jr.

TOXICOLOGIC ASSESSMENT OF THE HEALTH EFFECT OF SULPHUR DIOXIDE AND SULFATE PARTICULATES. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 371-383. (June 24-28.)*

The health effects of particulates in inhaled sulfur dioxide and other gases have not yet been satisfactorily defined. Several factors contribute to the biological response elicited when particles and gases are inhaled, including the size of the particle, its shape, the concentration of particles in the gas medium, and the physiochemical properties of the particulate, especially its reactivity with components of the gaseous phase and its solvent action related to the gaseous phase. While sulfur dioxide in sufficient concentrations is a respiratory irritant, it rarely occurs at irritation concentrations in the urban environment. Particulate less than 5 micron in diameter was obtained by high-volume sampling from four coal-burning plants in the Eastern United States. Monkeys inhaled this particulate for 18 mo, 22 hr a day, at concentrations of 100 or 500 microgram/cu m. No injurious effects occurred. A previous study showed that sodium chloride aerosol exacerbates the irritant properties of sulfur dioxide, as determined by increased pulmonary flow resistance in guinea pigs. The irritant properties of SO2 might be enhanced by its solubility in the particulate phase and its subsequent oxidation to sulfuric acid. Preliminary studies have shown that insoluble solid aerosols were inactive in potentiating the irritant effect of SO2 in guinea pigs, but soluble solid aerosols significantly potentiated the irritant property. Many sulfates in aerosol form possess far greater toxicologic activities than sulfur dioxide. (Author abstract modified)

61735 **APTIC NO. 81943**

Clemmesen, Johannes, Gerhard Hansen, Arne Nielsen, Jorgen Rojel, Jens Steensberg, Svend Sorensen, and Jorgen Toustrup

LUNG CANCER AND AIR POLLUTION IN FREDERICA. AN EPIDEMIOLOGICAL INVESTIGATION. *(Lungecancer og luftforurening i Fredericia). Text in Danish. Ugeskr. Laeg., 136(40):2260-2268, Sept. 30, 1974. 8 refs.*

Annual morbidity rates per 100,000 inhabitants for cancer of the lung among the population of Fredericia for the years 1968-1971 were compared with corresponding rates for the three other towns in Veljle county and for Copenhagen. On the basis of rates for various age groups the numbers expected were calculated and compared with factual figures. For Fredericia (all age groups) 64 cases were found against an expectation of 46.4 cases, an excess statistically significant at the 5% level. The excess of cases in Fredericia in comparison with the three other cities in the same county is therefore not ascribable to coincidence. It is well known that rates for lung cancer in Danish provincial towns on the whole are lagging about 10 yr behind the increase in rates for Copenhagen, the capital. However, for males in Fredericia rates for 1968-1971 correspond to rates for the capital only 5 yr previously. Also female rates for Fredericia are in excess of expectation for a provincial town. Numerous previous investigations have, so far, failed to support the assumption that air pollution alone is a significant causal factor in lung cancer. Results from the present preliminary investigation suggest further analysis of the occurrence of lung cancer in Fredericia and other regions of Denmark with a view to a possible causative connection with air pollution.

61736 **APTIC NO. 84057**

Conde, Jose

CANCER PREVENTION. ITS THEORETICAL AND PRACTICAL BASES. *(Prevencao do cancro. Suas bases, teoricas e praticas). Text in Portugese. Arq. Patol., 46(2-3):209-249, Aug.-Dec. 1974.*

The carcinogenic action of atmospheric factors is reviewed with the exception of those involved in the etiology of occupational cancers. Benzopyrene, found more frequently and in higher concentrations in urban than in the rural areas, is the predominant factor. Four categories of air pollution agents are defined: 1) carbon particles, oils, tar, metallic dusts, amorphous sulfur, and organic residues; 2) dusts, volatile carbon products, vapors, and gases; 3) gaseous oxidative substances, and 4) systemic poisons such as carbon monoxide, volatile cyanides, pesticides, and nicotine. Two types of air pollution: Los Angeles type oxidative smog consisting primarily of hydrocarbons, carbon dioxide, ozone, nitrogen oxides, and others, and reductive type atmospheres made of soots and sulfur oxides, as found in Japan, London, and other European cities, are considered. In the category of occupational exposure to air pollution factors, the arsenic, chromium, nickel, nitrogen mustard, aromatic amines, ionizing radiations, tar, and petroleum and their derivatives are recognized carcinogenic agents, confirmed by epidemiologic and experimental studies. Beryllium and iron are named as suspected carcinogens, while cobalt, selenium, lead, zinc, cadmium, nitrosamines, and other alkyl derivatives, nitroquinolines, acetofluoramine, carbamates, and hydrocarbons are considered potential carcinogens. Another air pollution occupational factor, asbestos and asbestos-like inorganic fibers (chrysotile, crocidotile, amosite, antofilite, and talcum) are considered responsible for lung carcinomas, pleural and peritoneal mesothelioma, and other types of neoplasms in workers involved in their manipulation and in certain segments of the population living in the proximity of the factories. Sunlight is meantioned as an etiological factor of skin cancers. Air pollution alone cannot be held responsible for the etiology of cancers; other factors such as social conditions, occupational habits, pre-existent bronchopulmonary illnesses, density of the population, urban residence, and tobacco smoking are strong contributing factors.

61737 **APTIC NO. 80042**

D Alfonso, G. and L. Scarano

TENDENCIES IN LUNG CANCER MORTALITY IN ITALY. *(Alcune tendenze della mortalita per cancro del polmone in Italia). Text in Italian. Lotta Tube. Mal. Polm. Soc., 44(3):409-436, Sept. 1974. 23 refs.*

Data collected on the temporal and geographical distribution of lung cancer in Italy reveal that lung cancer is increasing rapidly in males. It occupies the highest-incidence position in the scale of regional cancers and is the cause of a quarter of male mortality from malignant tumors. It is estimated that lung cancer will probably be the cause of 38% of male deaths from tumors by 1985, and will remain in the first position. The highest incidence of lung cancer mortality is found in the North of Italy, the lowest in the South and island areas; an intermediate rate is found in the central regions. The temporal increase in incidence rates has not significantly altered the scale order of each regional cancer although a certain equalization in rates has been observed. Correlations established between lung cancer mortality and certain exogenous factors concerning the etiology of cancer have revealed certain parallels with regard to mortality, tobacco consumption, and residence in urban areas in comparison with rural areas.

61738 **APTIC NO. 81967**

Dale, I. M., J. M. A. Lenihan, and Hamilton Smith

THE ENVIRONMENT AS REFLECTED IN HUMAN TISSUE AND HAIR - A COMPARISON. *Energy Research and Development Administration, Washington, D. C., Div. of Biomedical and Environmental Research and the American Nuclear Society, Isotopes and Radiation Div., Nucl. Methods Environ. Res. Conf., Columbia, Mo., 1974, p. 187- 197. 5 refs. (July 29-31.)*

NTIS: CONF-740701

Levels of mecury, arsenic, copper, zinc, and cadmium in hair, nails, and other human tissues obtained from residents in the Glasglow, Scotland area over a period of 10 yr were examined and compared with hair specimen levels over a 200-year period as well as with hair and nail specimens from widely separated geographical locations. Little or no change in the levels of the above elements was found in specimens analyzed over a 10-year period or those reviewed over a 200-year period. The same lack of variance was found for specimens obtained from widely separated geographical areas. Significantly increased concentrations of the above elements were found, however, in subjects occupationally exposed to the corresponding agent. High mercury levels (5.59 ppm in head hair) were observed for dentists exposed to the metal, and high arsenic levels (7.19 ppm in hair) were observed for agricultural workers exposed to the element.

61739 **APTIC NO. 82460**

Elikofer, Jorgen and Magnus Demsitz

LUNG CANCER IN FREDERICIA. *(Lungecancer i Fredericia). Text in Danish. Ugeskr. Laeg., 136(45):2550-2551, Nov. 1974.*

Sixty-four cases of lung cancer have been reported from Fredericia, Denmark, a small town with considerable asbestos-processing industry and galvanizing shops emitting chromates and nickel. Most of the lung cancer victims had been living near the asbestos-processing plants, which indicates the interaction of occupational and residential exposure. Pending a thorough analysis of the occupation and place of residence of the victims, this high incidence of lung cancer must be attributed to the interaction of different factors, including smoking.

61740 **APTIC NO. 79651**

Fischnaller, M.

COMPLEX EFFECT OF AIR POLLUTION ON HUMANS FROM A CYTOLOGICAL POINT OF VIEW. *(Gesamteinwirkung von Luftverunreinigung auf den Menschen aus der Sicht der Zytologie). Text in German. Praxis. Pheumol., vol. 28:775-776, 1974.*

Effects of inhaled air pollutants on lung cells are described. While most of the inhaled air pollutants are captured by the bronchial mucus and removed by the ciliated epithelium, pollutants penetrating farther are caught by the phagocytes of the alveolar epithelium and pollutants clearing this barrier are removed through the lymph system, and thus they may cause remote alterations, such as in the case of mesothelioma after exposure to asbestos. In an initial stage of the exposure, air pollution provokes an activation of the self-purification mechanism of the lung, which manifests itself in the formation of polynuclear giant ciliated cells. Later, the cell activity may be reduced due to the transformation of the ciliated epithelium into metaplastic epithelium, which, however, has an increased protective effect against pollutants. Intense exogenous irritation may induce atypical to malignant cell transformations. The increased incidence of sarcoidosis and alveolar cell carcinoma may be related to air pollution.

61741 **APTIC NO. 79744**

Frongia, N., A. Spinazzola, and A. Bucarelli

EXPERIMENTAL LUNG DAMAGE FROM PROLONGED INHALATION OF AIRBORNE PVC DUST. *(Lesioni polmonari sperimentali da inalazione prolungata di polveri di PVC in ambiente di lavoro). Text in Italian. Med. Lavoro (Milan), 65(9-10):321-342, Sept.-Oct. 1974. 4 refs.*

The effects of prolonged inhalation of airborne polyvinyl chloride (PVC) dust on the lungs of guinea pigs and rats were investigated. The animals were exposed for 2-7 mo to the same work environment as people who were normally employed in sacking PVC dust. The lung tissue of guinea pigs exhibited a quick histial-macrophagic lobulo-alveolar reaction at 2 mo. The cells have more than one nuclei and the cytoplasm appears granular. At 7 mo granulomatous foci of histial macrophagic elements are present while alveolitis type reactions tend to disappear. In rat lungs almost no histial macrophagic reaction is found in the lobulo-alveolar seat, but there is a septal thickening in the first 2-4 mo. At 7 mo, however, the histological picture is the same as for the guinea pigs.

61742 **APTIC NO. 72665**

Fruhmann, G. and H. Specht

BYSSINOSIS AND RARE HYPERSENSITIVITY TYPE PNEUMONITES. *(Byssinose und seltenere Hypersensitivitaets-Pneumonitiden). Text in German. Internist, no. 15:412-421, 1974. 54 refs.*

Byssinosis and rare hypersensitivity pneumonites are described. Cotton dust from raw cotton fiber processing plants was found to contain histamine, and a histamine liberator present in cotton dust is responsible for the so-called Monday symptom. The sensitization and byssinosis hazards are a function of the dust concentration and of the histamine content in the dust. The threshold limit concentration for cotton dust has been set at 1 mg/cu m with respect to byssinosis, but recent studies make a lower limit of 0.5 mg/cu m appear more realistic. Close correlation between the cotton dust concentration and exposure time, and the incidence of byssinosis was established. Rare hypersensitivity pneumonites, such as farmer s lung, mushroom-worker s lung, bagassosis, suberosis, maplebark disease, and wookpulp worker s disease and their respective antigens are described. Acute hypersensitivity pneumonitis can be caused by molds growing in humidifiers and air conditioners.

61743 **APTIC NO. 84498**

Fugas, Mirka and Fedor Valic

BIOLOGICAL SIGNIFICANCE OF SOME METALS AS AIR POLLUTANTS. PART II: MERCURY. *Yugoslav Academy of Sciences and Arts, Zagreb, Inst. for Medical Research and Occupational Health, Proj. 02-302-3, 198p., 1974. 53 refs.*

The association between low atmospheric mercury levels and changes in biological parameters was studied in inhabitants of a rural area with no known sources of mercury emission 60 km north of Zagreb; inhabitants of Zagreb, which has no specific, identified sources of mercury emission but was expected to have higher mercury levels due to miscellaneous sources; inhabitants of the mercury mining and smelting town of Idrija, excluding those occupationally exposed; and workers in merucry mines and smelters in Idrija. Coproporphyrin, coproporphyrin I and III ratio, glutathione, alkaline phosphatase, cholesterol, cholinesterase, delta-aminolevulinic acid dehydratase, glutamic-oxalacetic transaminase, glutamic-pyruvic transaminase, and glucose-6-phosphate dehydrogenase were studied. Atmospheric sampling showed that rural mercury concentrations were low, and seasonal mean concentrations differed little. Zagreb s atmospheric mercury concentrations, although higher, were not high. Concentrations suddenly increased between May and September at one Zagreb location where metallic mercury was discharged from a nearby laboratory. The concentrations did not vary considerably between months at Zagreb s other sampling sites. Concentrations were considerably higher near the smelting plant than elsewhere in Idrija. Winter and summer concentrations were highest; spring and autumn concentrations were approximately the same. The total mercury exposure of four or five workers from each group of occupationally exposed workers was measured over seven or eight entire shifts with personal samplers. The highest mercury exposure was that of the miners working in strata with metallic mercury, followed by those of smelter workers, miners working in strata with a low metallic mercury content, and auxiliary workers. The correlation between mercury in blood and other biological parameters is very low. The nonparametric Kruskal-Wallis one-way anova test, used to compare the biological variables of the four groups in terms of their different mercury exposure levels, was highly significant for all variables. The population groups usually differ in the level of the same biological parameter, especially comparisons including the occupational exposure group. The least differences are between the groups of urban and rural and Idrija inhabitants. (Author abstract modified)

61744 **APTIC NO. 84434**

Goldsmith, John R.

HEALTH HAZARDS FROM POWER PLANT EMISSIONS. *IN: Energy, the Environment, and Human Health. Asher J. Finkel (ed.), Acton, Mass., Publishing Sciences Group, Inc., 1974, Chapt. 12, p. 151-162. 32 refs. (Presented at the American Medical Assoc. Congress on Environmental Health.)*

Health hazards from power plant emission are discussed. Sulfur oxide and particulate matter, together, can increase the death rate due to chronic disease and aggravate these diseases. They are a causal factor in the occurrence of chronic bronchitis in children and adults. Carbon monoxide does not make an important contribution to community pollution from power plants. The health effects of nitrogen oxides are less well defined than those of combined SOx and particulate matter. Continuous nitrogen dioxide exposure leads to alterations in the cells lining the terminal respiratory bronchioles in experimental animals. In concentrations of several ppm, it leads to a condition in experimental animals that represents pulmonary emphysema in man. There is virtually no evidence that any of the types of hydrocarbons usually emitted from modern power plants are of long term consequence to human health.

61745 **APTIC NO. 81968**

Gordus, Adon A., Cathy M. Wysocki, Cornelius C. Maher, III, and Richard C. Wieland

TRACE-ELEMENT CONTENT OF HUMAN SCALP HAIR. *Energy Research and Development Administration, Washington, D. C., Div. of Biomedical and Environmental Research and the American Nuclear Society, Isotopes and Radiation Div., Nucl. Methods Environ. Res. Conf., Columbia, Mo., 1974, p. 198-205, AT(49-7)3140. 16 refs. (July 29, 30, 31.)*

NTIS: CONF-740701

Factors possibly affecting the measured trace element content of human scalp hair were evaluated. Frequency of hair washing and swimming, shampoos used, and gross differences in diet were found to affect the measured trace element content. Variations in elemental content with hair strand length were also observed, with general increases in element content occurring from the proximal to the distal segments of hair. Exocrine sweat appeared to contribute significantly to the measured trace element content of hair, suggesting that such variation must be considered in assessing data for historical hair samples which often represent clippings of distal hair segments. (Author abstract modified)

61746 **APTIC NO. 81284**

Gross, Paul

IS SHORT-FIBERED ASBESTOS DUST A BIOLOGICAL HAZARD? *Arch. Environ. Health, vol. 29:115-117, Aug. 1974. 18 refs.*

The pathogenicity of short-fibered asbestos dust is discussed. Evidence from animal studies is presented indicating that short fibered asbestos dust (less than 5 micron in length) is incapable of causing fibrosis or cancer. This finding in conjunction with the failure of different laboratories to discern abnormalities following prolonged asbestos feeding to rats is used to contest the concept that mesotheliomas and gastrointestinal cancers arise from the ingestion of asbestos dust cleared from the lungs. (Author abstract modified)

61747 **APTIC NO. 72601**

Haider, M., E. Groll-Knapp, H. Hoeller, M. Neuberger, and H. Stidl

EFFECTS OF MODERATE CO - DOSE ON THE CENTRAL NERVOUS SYSTEM-ELECTROPHYSIOLOGICAL AND BEHAVIOUR DATA, CLINICAL RELEVANCE. *Preprint, American Medical Assoc., Chicago, Ill., 18p., 1974. 43 refs. (Presented at the Air Pollution Medical Research Conference, San Francisco, Calif., Dec. 5-6, 1974.)*

The effects of moderate doses of carbon monoxide on human behavior and brain wave electroencephalograms were investigated in three series of experiments with non-smoking subjects of both sexes. Carbon monoxide exposures varied from 50-200 ppm, and carboxyhemoglobin values varied from 3% to 15%. Evoked potentials to median nerve stimulation after 30-40 min of 200 CO exposure showed a definite reduction in amplitude in the late components. Carbon monoxide exposure also caused a reduction of the negativity and following positivity of slow potential changes, with the degree of diminution being directly related to the CO dose. No effects on attention, memory, or mental arithmetical operations were observed after moderate CO exposure, though one positive result was obtained during a vigilance test. A depression in the rapid eye movement phase during sleep was also observed after CO exposure. Pyrithioxin appeared to counteract some of the effects of moderate CO exposure.

61748 **APTIC NO. 84446**

Hausknecht, D. F.

CORRELATION OF PUBLIC HEALTH EFFECTS AND LEVELS OF SULFUR DIOXIDE, PARTICULATES AND THEIR OXIDATION PRODUCTS. PHASE I. REVIEW OF AVAILABLE INFORMATION FOR ESTIMATION OF MORTALITY EFFECTS AN ANNUAL AND EPISODIC EXPOSURE LEVELS. *Science Applications, Inc., El Segundo, Calif., Electric Power Research Institute Rept. SAI-74-507-LA, 58p., July 1974. 34 refs.*

Studies investigating the relationship between public health effects and atmospheric concentrations of sulfur dioxide, sulfates, and particulates are reviewed. Exposure to intermittent high level pollution episodes (sulfur dioxide levels approaching 0.5 ppm) is generally associated with an increase in lung functional changes and more episodes of respiratory disease symptoms, especially among sensitive individuals in a general population. Most deaths due to chronic exposure to pollutants also occur among susceptible individuals. Respirable soluble sulfates are roughly three times more potent than sulfur dioxide in terms of pulmonary function measurements made on animals. The product of the sulfur dioxide concentration, particulate concentration, and duration of exposure is much more strongly related to health effects than exposure to an individual pollutant. Pollutant levels and respiratory mortality rates are presented for 53 county boroughs in England and Wales as well as for three Chicago areas.

61749 **APTIC NO. 82088**

Holland, W. W.

THE EFFECT OF ENVIRONMENTAL FACTORS ON HEALTH -- METHODS FOR POPULATION STUDIES. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 39-45. 6 refs. (June 24-28.)*

Epidemiological methods and sources of information which are useful for the investigation of the influence of environmental factors on health are discussed. The picture is obscured by a variety of factors involved in most investigations. A clue to the need for investigation is often first found in published statistical information, perhaps by examining mortality ratios. Prevalence studies and the considerations involved in the choice of a population for study are discussed. Questionnaires and physiological tests are discussed as methods of collecting the necessary information. Possible new techniques are also discussed. (Author abstract modified)

61750 **APTIC NO. 83725**

Horiguchi, Y., S. Sato, H. Wada, T. Takahashi, T. Shimada, K. Fukaya, S. Fukui, and S. Sugano

STUDIES ON THE EFFECT OF THE CAUSAL SUBSTANCE OF PHOTOCHEMICAL ENVIRONMENTAL DAMAGE ON THE LIVING BODY; ON THE SYNERGISM OF ACROLEIN AND OZONE. *(Kokagaku kogai busshitsu no seitai ni oyobosu eikyo ni kansurukenkyu). Text in Japanese. Kanagawa-ken Eisei Kenkyusho Nenpo (Annu. Rep. Kanagawa Prefect. Public Health Lab.), no. 24:107, 1974. 1 ref.*

Exposure of non-anesthetized rabbits to ozone at 0.3 - 15.7 ppm did not conspicuously affect the animals. At 50 ppm there was a slight suppression of cardiac function and respiratory motion. When rabbits were exposed to 5.3 ppm of ozone (at which there were no visible bodily changes) and to 10 ppm of acrolein simultaneously, a conspicuous reduction of the heart beat with the suppression of respiratory motion occurred. Simultaneous exposure to ozone and to ethyl nitrite did not cause such changes. The role of acrolein is thought to be important in photochemical smog occurrence in the presence of oxidant and nitrogen oxides.

61751 **APTIC NO. 82340**

Hueter, Carnow, Schmidt, Brille, Irwig, Knelson, Kumpf, Bourdeau, Zielhuis, and Karhausen

PANEL DISCUSSION. ***Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 351-368. (June 24-28.)***

Evaluation of health risks to populations exposed to irritant atmospheric pollutants is discussed, emphasizing the methodologic aspects of these human population studies. The relative importance of sensitive nonrespiratory biologic parameters for asessing adverse air pollution health effects was questioned. Selecting appropriate, susceptible populations bears directly on the validity and applicability of data from population studies. The epidemiologic study, as a methodologic approach to the assessment of air pollution effects, has been perfected to the point that the variables employed can be very carefully controlled. Special populations, such as survival populations, can be identified and avoided at the outset for a given study. If standardized methodologies can be developed and applied, then data from many different countries can be correlated to provide a firmer data base. Worldwide uniformity of methodology is not now feasible for certain types of studies. Because of such factors as sociocultural orientation differences in nutrition, and differences in genetics, certain populations cannot be compared. The effort towards compatability can be enhanced considerably by international cooperative studies. (Author abstract modified)

61752 **APTIC NO. 82092**

Irwig, L., D. G. Altman, R. J. W. Gibson, and C. Florey

AIR POLLUTION: METHODS TO STUDY ITS RELATIONSHIP TO RESPIRATORY DISEASE IN BRITISH SCHOOLCHILDREN. ***Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 289-300. 4 refs. (June 24-28.)***

The design and some of the methods used in a study of the relationship between air pollution and childhood respiratory disease are described. The study involves comparing childhood respiratory disease prevalence and measured pollution levels over several years when smoke emissions were decreasing due to designation of Smoke Control Areas under the British Clean Air Act. Two aspects of methodology are discussed: the selection of survey questions concerning respiratory illness on the basis of the association of these reported illnesses with impaired peak expiratory flow rates, and the use of quantal response regression to estimate the effects of atmospheric smoke and sulfur dioxide on respiratory disease after allowing for the effects of other factors. Analysis by this method on a subsample of the study children showed a positive association between some of the selected reported illnesses and both smoke and SO2. (Author abstract modified)

61753 **APTIC NO. 82188**

Jackson, David L. and Vaun A. Newill

THE STRENGTHS AND WEAKNESSES OF POPULATION STUDIES IN ASSESSING ENVIRONMENTAL HEALTH EFFECTS. ***Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 161-179. 11 refs. (June 24-28.)***

The basic purpose of the environmental regulatory process and the impact of the political and social framework on the design of health effects studies is briefly reviewed. The strengths and weaknesses of clinical and toxicological studies are outlined, and a more detailed exposition for population studies is presented. The problems of response indicators, exposure quantification, causality of association, combined pollutant effects, and the threshold concept are discussed. (Author abstract)

61754 **APTIC NO. 72580**

Kagawa, Jun, Toshio Toyama, and Masahiro Nakaza

PULMONARY FUNCTION TESTS FOR CHILDREN EXPOSED TO AIR POLLUTION. ***Preprint, American Medical Assoc., Chicago, Ill., 16p., 1974. 6 refs. (Presented at the Air Pollution Medical Research Conference, San Francisco, Calif., Dec. 5-6, 1974.)***

Pulmonary function tests were performed on 20 children (10 male and 10 female, 11 yr old) exposed to various air pollutants in a residential area of Tokyo. Both air pollution and temperature were monitored during low temperature and high temperature seasons to assess the effects of these variables on pulmonary function. Ozone appeared to affect mainly the upper airway passages, while nitrogen oxides, sulfur dioxide, and suspended particulates affected the lower airway tract. During the high temperature season, however, some reversal in these trends were noted. Airway resistance increased during both seasons with increasing ozone concentration and decreasing temperature, while maximum expiratory flow decreased with increasing concentration of nitrogen oxides. Maximum expiratory flow increased with increasing temperature.

61755 **APTIC NO. 70576**

Kasassow, P., B. Nikiforow, and L. Balabajewa

BIOCHEMICAL CHANGES IN EXPERIMENTAL ANIMALS WHICH WERE EXPOSED TO ATMOSPHERIC POLLUTIONS IN THE ENVIRONMENT OF A PETROCHEMICAL COMBINE. ***(Biochemische Veraenderungen an Versuchstieren, die atmosphaerischen Verunreinigungen in der Umgebung eines erdoelchemischen Kombinats ausgesetzt wurden). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 20(9):588-590, 1974. 14 refs.***

The petrochemical combine 8 km from Burgas, Bulgaria emits hydrocarbons, hydrogen sulfide, phenol, ammonia, acetone, hydrogen cyanide, methanol, and sulfur dioxide. For determination of the influence of this complex of atmospheric pollutants on the condition of some biochemical systems, experiments with rabbits were conducted. The animals were born in two villages close to the combine, in Kameno, 2.5 km east of the combine and in Dolno Jiserowo, 500 m southeast of the combine, and spent the first 3 mo of their lives there. Immediately after the transport of the animals to Sofia, the following examinations were performed: hemoglobin by Cannan; erythrocytes; reticulocytes by Heilmeyer; leukocytes eosinophils; oxygen consumption; decarboxylation of erythrocytes by Balabajewa; oxygen consumption by tissue homogenates by Kleinzeller; catalase activity in the blood and in tissue by Bach and Subrowa; peroxidase activity in blood, liver, an kidneys by Raschew; and cytochrome oxidase activity in blood, liver, kidneys, and brain by Vernon. The results reveal a suppression of the redox process and of the functional state of the liver and nervous system. These changes are particularly marked in animals exposed in the immediate vicinity of the combine.

61756 **APTIC NO. 76295**

Kasemir, H. and L. Kerp

COMPLEX EFFECT OF AIR POLLUTION ON HUMANS FROM IMMUNOLOGICAL VIEWPOINT. ***(Gesamteinwirkungen von Luftverunreinigungen auf den Menschen aus der Sicht der Immunologie). Text in German. Praxis. Pneumol., vol. 28:776-780, 1974. 25 refs.***

Studies on the effects of air pollutants on the immune response of the organism are reviewed. Nitrogen dioxide, sulfur dioxide, alone or in combination with carbon dust, ozone, and cigarette cause systemic immune suppression due to inhibition of the phagocytosis by pulmonary macrophages and to interferences with the protein synthesis and hemolytic activity of the complement. Thus, air pollutants can considerably increase the susceptibility of the organism to bacterial and viral infection due to disturbances in the interaction between macrophages and T and B lymphocytes.

61757 **APTIC NO. 83593**

Kawakami, Masahiko, Shigeru Sato, Shinsaku Maeda, and Tamotsu Takishima

ULTRASTRUCTURAL CHANGES OF THE LUNGS IN RATS EXPOSED TO LOW CONCENTRATION OF OZONE: A COMPARATIVE STUDY BY SCANNING AND TRANSMISSION ELECTRON MICROSCOPY. *J. Clin. Electron Microsc., 7(304):396-397, 1974.*

The untrastructural changes occurring in the respiratory system of rats exposed to a low concentration (0.2 to 0.4 ppm) of ozone as encountered in urban environments were determined. The most sensitive site in the large and small bronchi is a cilium. One or several hemispheric extrusions, about the size of diameter of a cilium, were observed on the surface of lesions. The hemispheric extrusions consisted of cytoplasmic swellings of localized portions of a cilium. Hemispheric extrusions of cilia were seen in bronchioli. Irregularly formed bodies of various sizes were found on the bronchiolar surface.

61758 **APTIC NO. 81957**

Kenton, Charlotte

AIR POLLUTION EFFECTS WITH EMPHASIS ON HYPERSENSITIVITY. *National Library of Medicine, Bethesda, Md., Literature Search 73-3, 34p., 1974. 546 refs.*

A computer-generated bibliography was produced by the National Library of Medicine s Medical Literature Analysis and Retrieval System. A major portion of the relevant citations appearing in Index Medicus between January 1970 and February 1973 are included. Each citation is listed together with the descriptors selected from the National Library of Medicine s list of medical subject headings under which the article was indexed.

61759 **APTIC NO. 82153**

Kikuchi, K. and Y. Nagayama

ULTRASTRUCTURE OF TRACHEAL CILIA DURING DEGENERATION BY SULPHUROUS ANHYDRIDE AND EXHAUST GAS. *J. Fr. Oto-Rhino- Laryngol., Audio-Phonol. Chir. Maxillo-Fac., 23(8):697, Oct. 1974.*

The ultrastructural changes of the tracheal cilia in the guinea pig after inhalation of air pollutants were investigated. Forty-two guinea pigs were divided into three groups. Animals in the first group were exposed to sulfurous acid gas for 3 to 9 hr in a chamber. Animals in the second group were exposed to exhaust gas from a car for 10 to 90 min. The third group served as controls. The trachea was removed after inhalation of the gases and observed with scanning and transmission electron microscopes. The first change of the tracheal cilia after inhalation of sulfurous acid gas was swelling to the cilium. Swelling of the ciliary membrane was extended to the whole cilium and formed a sacklike shape with increasing inhalation time. Then, the cilium was partially broken. The initial change of the cilium after inhalation of exhaust gas involved the ciliary membrane, which became uneven and irregular over its full length. The unevenness of the whole ciliary membrane was a distinctive feature. These results suggest that inhalation of sulfurous acid gas and exhaust gas is a very important factor in chronic respiratory disease. (Author abstract modified)

61760 **APTIC NO. 76241**

Kilburn, Kaye H.

EFFECTS OF TOBACCO SMOKE ON BIOLOGICAL SYSTEMS. *J. Respir. Dis., vol. 91:63-78, 1974. 101 refs.*

A review of the toxic effects of cigarette smoke on animal and human biological systems ranging from isolated enzymes to different cell systems is presented. The mainstream and sidestream effects of the following cigarette smoke components are discussed: carbon monoxide, hydrogen cyanide, arsenic nitric oxide, nitrogen dioxide, aldehydes, alkaloids, tar materials, carcinogenic polynuclear hydrocarbons, polyphenols, and metals such as cadmium. Hydrogen cyanide may be responsible for the rapid cessation of ciliary beating in the respiratory tract of smokers. Cadmium and arsenic may be implicated in emphysema. Polyphenols are strong irritants and may serve as cocarcinogens, promoting such initiators as benzo(3-4)pyrene. Nitrogen dioxide which is found in levels as high as 400 ppm in mainstream smoke produces early changes in the morphology of the respiratory and terminal bronchiolar region in rat lungs at levels of 2 ppm. These changes include loss of cilia and an increase in microvilli.

61761 **APTIC NO. 67074**

Kimbrough, Renate D. and Ralph E. Linder

THE TOXICITY OF TECHNICAL HEXACHLOROBENZENE IN THE SHERMAN STRAIN RAT. A PRELIMINARY STUDY. *Preprint, Environmental Protection Agency, Chamblee, Ga., Chamblee Toxicology Lab., 10p., 1974 (?). 14 refs.*

Technical grade hexachlorobenzene (HCB), a fungicide to control bunt of wheat and a waste by-product from chlorinated hydrocarbon production, was fed to groups of 10 male and 20 female rats at the dietary levels of 0, 100, 500, and 1000 ppm for 4 mo. None of the control rats and none of those fed 100 ppm HCB died prior to sacrifice. Two of 10 males and 14 of 20 females died at the dietary level of 500 ppm, and three of the males as well as 19 of the females died at the dietary level of 1000 ppm. Compared to the control group, the liver, spleen, adrenals, lungs, and kidneys weighed more in the groups that were exposed to the 500 and 1000 ppm levels of HCB. Various morphological changes were observed in the livers of the experimental animals. In addition, hyperplasia of the adrenal cortex, as well as large numbers of macrophages in pulmonary alveoli and lung fibrosis were noted. Since the HCB fed to the rats was only between 93-95% pure, additional studies are necessary to elicit whether the reported pathology is entirely due to the effect of HCB. (Author abstract modified)

61762 **APTIC NO. 82091**

Knelson, John H.

DESIGNING THE EXPOSURE/RESPONSE MATRIX IN ENVIRONMENTAL HEALTH STUDIES. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 181-191. (June 24-28.)*

A three-dimensional Exposure-Response Matrix is presented as an approach to determining the relationship between environmental stress or insult, and the resulting health effect. One dimension represents pollutant concentration gradient, the second is range of susceptibility within a population, and the third is the spectrum of response within population subsets of different susceptibility. This method of approaching study design and interpreted results is applicable to classic toxicology, epidemiology, and clincal research. The pollutant concentration gradient must be measured unambiguously and accurately for population studies and reproduced in controlled environmental laboratories for toxicologic and clinical studies. The pollutant gradient or a body pollutant burden is usually treated as the independent variable. The normal range of human susceptibility must be recognized when characterizing the population in an epidemiologic study, when establishing criteria for subject selection in a clinical study, or when preparing animal models of human disease. There is also a spectrum of response within each more or less susceptible subset of the population. It is usually a function of pollutant concentration, duration of exposure, and the presence of costressors. The final goal of environmental health effects research is the construction of this three-dimensional dose-response relationship to calculate risk factors which reflect both the degree of hazard and the size of the population at risk for any set of environmental circumstances. (Author abstract modified)

61763 **APTIC NO. 84543**

Koiwai, K. and E. Fukushima

ON THE SURVEY OF HEALTH EFFECTS OF COMBINED AIR POLLUTION. *(Fukugo taiki osen kenko eikyo chosa ni tsuite). Text in Japanese. Chiba-ken Eisei Kenkyu Jo Nenpo (Annu. Rep. Pub. Health Lab. Chiba Prefect.), no. 23:122-123, 1974. 4 refs.*

A prefectural survey on the health effects of combined air pollution is reported. The lead content of urine of inhabitants of air-polluted Ichihara City and of a control city, Sakura was studied. The age of examined inhabitants was over 30 for females and over 60 in males. The lead content of 52 inhabitants of Ichihara City ranged from 0.00 to 0.02 mg/l. That of 51 in Sakura City ranged from 0.00 and 0.01 mg/l. These values were considerably lower than published data.

61764 **APTIC NO. 84655**

Komatsu, G., M. Shishido, T. Sugita, F. Higuchi and A. Ogihara

RESULTS OF MASS MEDICAL EXAMINATION BY FLOW-VOLUME CURVE OF THE INHABITANTS IN THE AUTO EXHAUST-POLLUTED AREA. *(Jidosha haishutsugas osenchiku jumin no FVkyokusen nado ni yoru shudan kenshin seiseki). Text in Japanese. Kanagawaken Koshu Eiseigaku Zasshi (Bull. Kanagawa Prefect. Public Health Assoc.), no. 21: 62-63, 1974.*

The results of mass medical examination of 39 inhabitants (age 35-69) living along a busy road with an average of 200 motor vehicles and of 45 inhabitants living in a non-polluted area were compared using vital capacity, % vital capacity, flow-volume curve, chest roentgenography, and sputum tests. The major findings on the inhabitants in the polluted area with nitrogen oxides 7-10 times higher than the standard were: obstructive disturbance of peripheral airway appeared mainly as a reduction of V50 on the flow-volume curve; a partly fibrotic roentgenographic picture was observed; and these findings were prevalent in people living therein for more than 5 yrs.

61765 **APTIC NO. 82187**

Kosta, L., A. R. Byrne, and V. Zelenko

MERCURY-SELENIUM ASSOCIATION IN PERSONS EXPOSED TO INORGANIC MERCURY. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 245-260. 22 refs. (June 24-28.)*

The distribution of mercury and selenium in organs obtained from autopsies of persons working in or living around the mercury mine of Idrija was measured and compared to controls with no known exposure. These investigations revealed an unexpected distribution pattern with a very high uptake by the thyroid and pituitary glands, accompanied by a very long biological half life. The kidney, normally considered to be the prime accumulator, ranked third behind these glands. There was no exception to this pattern in eight cases of professionally exposed miners. In eleven subjects of the general population of Idrija, there was a greater variability, but the thyroid, pituitary, and kidney still showed a considerable increase in concentration as compared to nonexposed persons. Mercury concentrations for professionally exposed persons, the Idrija population, and controls are presented in tabular form for other organs. There is a remarkable correlation between the mercury and selenium contents for the thyroid, pituitary, and kidney. The strong mercury-selenium linkage should be considered in attempting to explain this effect. Negligible methyl mercury concentrations were also found in some organs from mercury miners and the Idrija population. (Author abstract modified)

61766 **APTIC NO. 82339**

Kumpf, J., M. Arhirii, B. Grab, and M. J. Suess

STUDY ON LONG-TERM EFFECTS ON HEALTH OF AIR POLLUTION. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 339-347. 9 refs. (June 24-28.)*

The relationship between long-term exposure to air pollution and indices of chronic respiratory disease in children living under different social and domestic circumstances was investigated in a number of European countries. Schoolchildren, 8 to 10 yr old, living in areas with different levels of air pollution, were investigated by means of a questionnaire filled in by parents or guardians, and by means of peak flow rate and other lung function tests. Results from highly polluted areas, with annual median sulfur dioxide concentrations more than 100 microgram/cu m and annual median concentrations of standard smoke over 40 microgram/cu m, and from low-polluted areas, with SO2 below 50 microgram/cu m and standard smoke below 30 microgram/cu m were compared. The data from Denmark do not seem to indicate a clear correlation between prevalence of respiratory disease and air pollution when results are adjusted for social class differences. A general trend towards higher prevalence of respiratory symptoms occurred in the high pollution area in the Netherlands, although the findings did not reveal clear and significant differences. Preliminary analysis of data from Czechoslovakia showed significant differences in the prevalence of respiratory symptoms between high-level and low-level pollution areas. Data from Romania yielded preliminary indications of a higher prevalence of respiratory symptoms in a highly polluted area. (Author abstract modified)

61767 **APTIC NO. 84385**

Lauwerys, R.

EPIDEMIOLOGICAL SURVEY IN WORKERS EXPOSED TO CADMIUM. AN EXAMPLE OF CASE-CONTROL STUDY. *(Enquete epidemiologique parmi des travailleurs exposes au cadmium. Un exemple de case control study). Text in French. Acta Tuberc. Pneumol. Belg., 65(1):55-59, Jan.-Feb. 1974. 3 refs.*

Three groups of workers were studied for exposure to cadmium. In the first group (31 women: 13 smokers, 18 non-smokers) exposed for 4 years to a total of about 30 microgram/cu m, the only significant difference was the urinary excretion of cadmium. In the second group (27 men: 17 smokers, 10 non-smokers) exposed to a total of about 140 microgram/cu m for about 8.6 years, the respiratory test results were lower in both sub-groups than in the control group, but differences did not reach 5%. In the exposed subjects, not only were the blood and urine cadmium levels high, but 15% of the subjects already displayed renal lesions. In the third group (22 smokers) exposed for about 27.8 years to about 70 microgram/cu m, coughing was significantly more frequent. Vital capacity, maximum exhaled volume/second, and peak flow were significantly weaker in the exposed subjects, although the difference was moderate in terms of absolute value; 68% of the exposed subjects displayed renal lesions evidenced by an excessive proteinuria and an abnormal electrophoresis of the urinary proteins. Thus, prolonged exposure to cadmium dusts lower than the American tolerance limit (200 microgram/cu m) can lead to a light respiratory obstruction syndrome. The pulmonary disturbances seem to occur at a later state than the urinary lesions. To prevent these, the average concentration of cadmium should not exceed 50 microgram/cu m.

61768 **APTIC NO. 84435**

Lave, Lester B. and Linnea C. Freeburg

HEALTH COSTS TO THE CONSUMER PER MEGAWATT HOUR OF ELECTRICITY. *In: Energy, the Environment, and Human Health. Asher J. Finkel (ed.), Acton, Mass., Publishing Sciences Group, Inc., 1974, Chapt. 16, p. 209-227. 108 refs. (Presented at the American Medical Assoc. Congress on Environmental Health, April 1973.)*

An abstract comparison is made between the airborne emissions of a 1000 Mw(e) coal burning power plant and a 1000 Mw(e) light water reactor based on mortality risks. The annual mortality risk for individuals continuously exposed to gaseous effluent at the specified dilution from a plant burning 3.5% sulfur coal with 15% ash is estimated at 334 times 10 to the -6th power. The emissions from the coal burning plant represent a mortality risk approximately 150 times the risk from airborne effluents of a boiling water type reactor and approximately 110,000 times the risk from airborne effluents of a pressurized type water reactor. For emissions of a plant burning 1.5% S coal, the corresponding figures are 69 and 50,000 times, respectively, and for emissions of the same plant removing 75% of the SO2 via stack gas scrubbing methods, the estimates are 24 and 18,000 times, respectively.

61769 **APTIC NO. 82337**

Leeder, S. R., A. J. Woolcock, J. K. Peat, and C. R. B. Blackburn

RELATIONSHIP OF AIR POLLUTION TO PREVALENCE OF LOWER RESPIRATORY ILLNESS AND LUNG FUNCTION IN AUSTRALIAN SCHOOLCHILDREN. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 63-76. 15 refs. (June 24-28.)*

The association of different sulfur dioxide and smoke levels with prevalence of past respiratory illness and lung function, assessed by the maximum expiratory flow-volume curve, was studied in two populations of Australian schoolchildren: 12,000 in Sydney and nearly 300 in Port Kembla, a steel-industry coastal city 60 mi south of Sydney. Sulfur dioxide and smoke levels were low by international standards in Sydney, but high peak concentrations of SO2 were recorded in Port Kembla. Children attending school in the more polluted areas of Sydney and in Port Kembla had the same prevalence of previously treated lower respiratory illness as children in the less polluted regions. There was a small, statistically significant correlation between lower forced vital capacity and higher pollution areas in older Sydney boys. This correlation was independent of the effects of other factors. There was no sigificant decrease in maximum expiratory flow rates in children in the more polluted areas when the effects of their smaller vital capacities were allowed for. Allowances must be made for changes in lung growth characteristics in children living in different areas before concluding that isolated measurements of reduced expiratory flow rates represent lung or airway damage. (Author abstract modified)

61770 **APTIC NO. 76299**

Leuschner, Ruth M. and C. Virchow

ANIMATE AND INANIMATE SUSPENDED PARTICLES AS AIR POLLUTANTS FROM THE VIEWPOINT OF ALLERGOLOGY. *(Belebte und unbelebte Schwebeteilchen als Luftverunreinigung aus der Sicht des Allergologen). Text in German. Praxis. Penumol., vol. 28: 780-786, 1974. 18 refs.*

Methods for the determination of the pollen and spore count in the air, and results of such countings are presented. The Burkard type pollen trap, used extensively in Switzerland and West Germany, uses a vaseline-coated drum which completes one revolution in one week, after which it is replaced and the pollens sucked in through a gap are evaluated microscopically. Seasonal and yearly variations were observed in the pollen count in the air. Close correlation was established between the occurrence of pollens and the incidence of pollinosis attacks. The pollen count is usually lower in high mountainous regions than in plains.

61771 **APTIC NO. 81511**

Likhachev, Y. P. and R. S. Vorontsov

DIFFUSE PROGRESSIVE ANGIOMYOMATOSIS OF THE LUNGS AND LYMPH NODES. *(Diffuznyy progressiruyushchiy angiomiomatox legkikh i limfaticheskikh uzlov). Arkh. Patol., 36(2):13-17, 1974. 14 refs. Translated from Russian, 9p.*

Case histories of diffuse progressive angiomyomatosis of the lungs and lymph nodes are presented. The disease appears to be genetically-caused and occurs in women more often than in men. It is accompanied by a bronchiolar-alveolar microcystic restructuring of the lungs. Pulmonary-cardiac deficiency and decompensation of circulation are linked with the progression of the disease. A review of two cases, one involving a 41-year-old female in contact with metallic beryllium for 17 yr and the other a 46-year-old female in contact with cement dust and lead dust for 4 yr suggests that occupational exposure to dust may possibly facilitate the progression of the disease.

61772 **APTIC NO. 82010**

Love, G. J.

EPIDEMIOLOGIC STUDIES OF ADVERSE HEALTH EFFECTS ASSOCIATED WITH EXPOSURE TO AIR POLLUTION. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 301-312. 12 refs. (June 24-28.)*

Epidemiologic studies were carried out in groups of communities selected for similar climate and demographic characteristics but different air pollution levels. Measurements of health status within each community were made in a manner which permitted differences to be associated with differences in exposure to pollution. Both acute and chronic health impairment were associated with exposure to ambient air containing approximately 100 microgram/cu m sulfur dioxide, 100 microgram total suspended particulate (TSP), and 15 microgram/cu m suspended sulfates. The levels of suspended sulfates were associated more closely and more consistently than were the levels of the either TSP of SO2. (Author abstract modified)

61773 **APTIC NO. 81523**

Matokhnyuk, L. A., V. N. Karpenko, A. I. Olefir, and I. A. Anina

EXPERIMENTAL DATA FOR JUSTIFYING THE THRESHOLD LIMIT VALUE FOR POLYMARCINE IN THE AIR IN A WORK AREA. *(Eksperimental nyye materialy k obosnovaniyu predel no dopustimoy kontsentratsii polimartsina v vozdukhe rabochey zony). Gigiena i Sanit., 39(9):17-20, 1974. 8 refs. Translated from Russian, 8p.*

Animal toxicity experiments were conducted to establish a threshold limit value for polymarcine in work atmospheres. Polymarcine is a fungicide used for combating rot diseases in vegetable and fruit crops and consists of zinc ethylene-bis-dithiocarbamate, manganese ethylene-bis-dithiocarbamate, and ethylene thiuram disulfide in a 40:20:40 ratio. Acute and chronic poisoning in laboratory animals is characterized by a disorder in the blood picture and in the activity of the enzymes aspartate-aminotransferase, aldolase, and alkaline phosphatase. A reduction in immunobiological reactivity is also observed. Based on the above observations and on data obtained for dithiocarbamine pesticides with similar structures, a threshold limit value of 0.5 mg/cu m (aerosol) is recommended for polymarcine in work atmospheres.

61774 **APTIC NO. 80197**

Mazliak, P.

PHYSICOCHEMICAL FACTORS OF THE PENETRATION OF TOXIC SUBSTANCES. *(Facteurs physicochimiques de la penetration des toxiques). Text in French. Ann. Nutr. Aliment, 28(4):277-296, 1974. 10 refs.*

The physicochemical factors involved in the penetration of toxic substances into cells were studied on a model. The penetration of a foreign substance into the cell is determined by such factors as the chemical nature of the cell membrane, the cytoplasm, and the foreign substance, and by the molecular organization of the membrane and of the cytoplasm. The central hydrophic zone of the cell membrane plays the major role in the penetration of the toxic substance, as the passage through the hydrophilic outer zone and the passage from the central lipophilic zone into the aqueous medium of the cytoplasm are fairly easy. Halogens, gaseous halogenides, gaseous sulfur and nitrogen compounds, compounds of phosphorus and arsenic, carbon oxides, carbon sulfides, gaseous hydrogen, cyanide, hydrocarbons, acetone, methylene chloride, dichloroethylene, trichloroethylene, toluene and its derivatives penetrate through the cell membrane by simple diffusion. The penetration of solid fluorides, fluorosilicates, mercury, copper, lead, and chromium involved active transport or a diffusion mechanism implying a bond with the membrane proteins.

61775 **APTIC NO. 73532**

McRitchie, R. J. and S. W. White

ROLE OF TRIGEMINAL, OLFACTORY, CAROTID SINUS AND AORTIC NERVES IN THE RESPIRATORY AND CIRCULATORY RESPONSE TO NASAL INHALATION OF CIGARETTE SMOKE AND OTHER IRRITANTS IN THE RABBIT. *Australian J. Exp. Biol. Med. Sci., 52(1):127-140, Feb. 1974. 28 refs.*

New Zealand white rabbits were exposed to inhalations of cigarette smoke and other respiratory irritants (formaldehyde, ammonia, and benzene vapor) to study the contributions of trigeminal, olfactory, carotid sinus, and aortic nerve pathways to the reflex apnea in expiration, mild hypertension, and marked bradycardia. Animals were used with trigeminal nerve ablation, olfactory bulb ablation, total and selective section of the carotid sinus and aortic nerves, and combinations of the above lesions. Trigeminal afferents were the primary source of respiratory and circulatory disturbance. Olfactory afferents did not initiate such disturbances but did weakly potentiate the apnea induced by trigeminal stimulation. Arterial baroreceptor mechanisms contributed to evoked bradycardia. Arterial chemoreceptor mechanisms did not contribute to the circulatory effects; rather, they acted to terminate thee induced apnea. (Author abstract modified)

61776 **APTIC NO. 82338**

Mitchell, Ralph I., Ronald Williams, Roger W. Cote, Richard R. Lanese, and Martin D. Keller

HOUSEHOLD SURVEY OF THE INCIDENCE OF RESPIRATORY DISEASE IN RELATION TO ENVIRONMENTAL POLLUTANTS. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 47-62. 7 refs. (June 24-28.)*

The open flame in gas ranges can produce short-term elevation of nitrogen dioxide concentrations in the cooking area. The incidence of respiratory disease was compared in households using gas cookery and households using electric cookery. Family health and demographic data were obtained from 441 families in a relatively unpolluted midwestern suburban community. Reports of acute respiratory illness were obtained through biweekly telephone calls to each of the households for a period of 1 yr. The respondents were asked to report respiratory illness in any member of the household, and to indicate the presence or absence of a set of signs and symptoms. Ambient air was analyzed, indoors and outdoors, in a sample of the households, and pulmonary function tests were conducted on 42% of the participants, representing both types of household. Multiple regression was carried out to determine the best set of independent variables as predictors of respiratory disease incidence. The overall outcome indicates no significant difference in reported respiratory illness between the members of households cooking with gas and those cooking with electricity. (Author abstract modified)

61777 **APTIC NO. 84137**

Monturiol, J. M., J. Artalejo, J. Garrido, and J. Ruiz Zubero

SURVEY METHOD FOR CHRONIC BRONCHITIS. RESULTS OF A PILOT STUDY IN THREE DIFFERENT POPULATION GROUPS. *(Metodologia de las encuestas sobre la bronquitis cronica. Resultados de una encuesta piloto en tres grupos de poblacion). Text in Spanish. Rev. Enf. Torax, 23(80-89):81-108, 1974. 13 refs.*

The results of a survey on the incidence and causes of chronic bronchitis (CB) carried out during 1972 and 1973 by means of a questionnaire submitted to 7806 subjects (5996 men and 1810 women) chosen from three different segments of the population (5634 employees of Standard Electrica of Madrid; 609 persons from various districts of Guadalajara; 1563 inhabitants of six agricultural villages from the Madrid region) are reported. The CB found in 1006 (12.86%) of the subjects was attributed to cigarette smoking (75.15% of the men and 10% of the women were smokers), and to socioeconomic conditions or cold climate. Environmental pollution at the existing levels did not influence the appearance of CB, as exemplified in the villages of the Madrid region (308/1563 subjects with CB) with clean air but a high number of smokers among the men (76.19%), cold winters and the lowest average salaries of the three groups sampled. Occupational air pollution, however, is considered a high risk factor, especially when associated with cigarette smoking. Of 860 workers at Standard Electrica (SE) subjected to occupational exposure to air pollution for one year or more, 207 (24%) developed CB; 402 were exposed to dust (emery, wood, etc.), 330 to irritating chemical smoke or gases from electrolytic baths (chromium, cyanides, trichlorethylene, cadmium, nickel, fluorine, carbon monoxide and carbon dioxide, welding fumes, varnish naphtha and synthetic or cellulose dyes, 128 were exposed to various types of occupational air pollution for at least one year before being hired by SE; 661 were cigarette smokers. Of 2656 SE workers not exposed to air pollution risks, only 290 (10.9%) developed CB; 2029 were smokers. A national survey using the British Medical Council - type questionnaire is recommended by the authors.

61778 **APTIC NO. 79275**

Morresi, Angelo C., Paul N. Cheremisinoff, and Richard A. Young

HUMAN RESPONSE AND EFFECTS OF ODORS. *In: Industrial Odor Technology Assessment. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich.,* *Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 1, p. 1-25. 32 refs.*

A general review of human responses to odors is presented. Topics discussed include: categories of various odor types, ratings of odor intensity and pleasantness/unpleasantness, the classification of primary odors (those which cannot be broken down any further), chemical examples of primary odors, odor interaction, human adaptation to odors, and dysfunctions in olfactor sensitivity such as anosmia (the total loss of sensitivity to an odor or odors).

61779 **APTIC NO. 79720**

Mundt, W., R. Ruppel, V. Kassebart, J. Angerer, and D. Szadkowski

A GASCHROMATOGRAPHIC METHOD FOR EPIDEMIOLOGICAL STUDIES ON CARBON MONOXIDE IN AIR AND BLOOD. *(Ein gaschromatographisches Verfahren fuer epidemiologische Untersuchungen auf Kohlenmonoxid in Luft und Blut). Text in German. Inn. Med., 1(3):145-151, 1974. 35 refs.*

A gas chromatographic method for epidemiological studies on carbon monoxide in air and blood is described. Carbon monoxide is separated from other substances using a molecular sieve. It is reduced to methane on a nickel catalyst and measured by a flame ionization detector. Blood samples are first treated with potassium hexacyanoferrate (III) to release CO bound to hemoglobin. The reliability of the methods for estimating CO in air as well as in blood are sufficient for epidemiological studies. The mean COHb concentration of a group of nonsmokers not exposed to CO is 0.67% COHb.

61780 **APTIC NO. 84444**

Neri, L. C., J. S. Mandel, D. Hewitt, and D. Jurkowski

CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN TWO CITIES OF CONTRASTING AIR QUALITY. *Preprint, Univ. of Ottawa, Ottawa (Ontario), Dept. of Epidemiology and Community Medicine, Health and Welfare Canada, Bureau of Epidemiology, and Univ. of Toronto, Toronto (Ontario), Dept. of Epidemiology and Biometrics, 17p., 1974 (?). 11 refs.*

Spirometric tests of 3280 Ottawa residents and 2208 Sudbury residents revealed that the mean value of the ratio of 1-second forced expiratory volume to forced vital capacity was lower among residents in the latter city where sulfur dioxide levels were appreciably higher. The difference was statistically significant in both males and females and remained significant when effects attributable to age and smoking status were taken into account. The prevalence of symptomatic bronchitis was significantly higher in Sudbury males than in Ottawa males, though no corresponding difference was detected among females from these cities. (Author summary modified)

61781 **APTIC NO. 81766**

Nulsen, A., P. G. Holt, and D. Keast

CIGARETTE SMOKING, AIR POLLUTION AND IMMUNITY: A MODEL SYSTEM. *Insp. Immun., 10(6):1226-1229, Dec. 1974. 17 refs.*

The immunological effects of cigarette smoking and air pollution were investigated by exposing mice to fresh cigarette smoke, a mixture of sulfur dioxide (5 ppm) and carbon monoxide (50 ppm), or both for periods up to 18 wks. After varying exposure times, the animals were intratracheally inoculated with 100 million sheep erythrocytes and sacrificed 7 days later. Plaque-forming cell responses in spleens and a pool of the cervical and mediastinal lymph nodes were measured along with serum hemagglutinating and hemolytic responses. Both the organ and serum responses exhibited stimulation in the early phase of exposure prior to a depression with prolonged exposure. The greatest depression was observed in animals that were chronically exposed to both fresh cigarette smoke and the gas mixture. The results suggest that industrial air pollutants may exert marked effects on the immune system in situations where the added stress of cigarette smoke inhalation exists concurrently. (Author abstract modified)

61782 **APTIC NO. 72534**

Oda, H., H. Nogami, S. Kusumoto, and Y. Nakajima

EFFECTS OF EXPOSURE TO NITRIC OXIDE ON MOUSE. *(Issankachisso bakuro nommausu ni oyobosu eikyo). Text in Japanese. Preprint, Pharmaceutical Society of Japan, Tokyo, p. 22, 1974. (Presented at the Environmental Toxicology, 1st, Symposium, Osaka, Japan, Nov. 21-24, 1974.)*

Nitric oxide (NO)-hemoglobin and methemoglobin in the blood of mice exposed to NO for a short period were measured. After exposure for 1.5 hr to 10 and 70 ppm of NO (free from NO2), NO-hemoglobin was 0.15 + or - 0.04% and 1.55 + or - 0.36% respectively. Methemoglobin at the same time was 0.34 + or - 0.10% and 9.26 + or - 0.47%. The carboxyhemoglobin in blood of mice exposed to carbon monoxide at 100 ppm for 1.5 hr was 12.1 + or -2.3 ppm. According to the histopathological examination of mice exposed for 5 hr 12 ppm of NO, the alteration of the lung and trachea was accompanied by vacuolar denaturation and wax-like denaturation of heart muscle, dilatation of capillary veins, and anemic denaturation in the brain. Although in vitro in anaerobic conditons the affinity of NO to hemoglobin is greater than that of CO by a factor of more than 1000 under in vivo conditions the amount of NO which binds hemoglobin was smaller than that of CO at concentrations of 70 and 100 ppm.

61783 **APTIC NO. 81181**

Ozaki, Kyosuki, Hiroshi Ando, Yoichi Nabeshima, Yoshiyuki Nuno, Shigehiko Hattori, Shogo Yamamoto, Shinsaku Myojo, Tsuneyoshi Onishi, Reiko Kawabata, Kyoko Watanabe, Kangen Jinno, Kyoko Shiraishi, Minekatsu Taniya, Hiroshi Toyota, and Yutaka Kurokawa

THREE YEAR STUDY OF HEALTH EXAMINATION AT IWANABE FROM 1970, MAINLY ON THE EFFECTS OF FLUORIDE. *Text in Japanese. Ehime Kenritsu Byoin Gakkai Kaishi (Ehime J. Med.), 12(2):66-71, Nov. 1974. 6 refs.*

Partial damage to rice plants probably due to fluorides from an aluminum electrolysis factory in Niihama, followed by findings of abnormally high amounts of fluorine in rice plants and grain led to medical examinations and measurement of fluorides in 1970. Control measures at the factory led to a decrease in the concentration of hydrogen fluoride in the air, from 7-8 ppb in March 1969 to 0.4 ppb in March 1972. The plant damage was most apparent on gladiolus and pine trees. The amount of fluorine in daily urine varied by family and age, suggesting that inhaled air is not the important factor. On the other hand, the inhabitants complain of sticking in the throat and tiredness of the legs, although these complaints are decreasing with time. The problem of fluorine pollution has been settled by the efforts of industry and mass migration of inhabitants from the area.

61784 **APTIC NO. 70690**

Pankow D. and W. Ponsold

SYNERGISTIC EFFECT OF CARBON MONOXIDE WITH OTHER BIOLOGICALLY ACTIVE INJURIOUS FACTORS ON THE ORGANISM. *(Kombinationswirkungen von Kohlenmonoxid mit anderen biologisch aktiven Schadfaktoren auf den Organismus). Text in German. Z. ges. Hyg. ihre Grenzgebiete (Berlin), 20(9):561-571, Sept. 1974. 138 refs.*

The combined effects on biological organisms are reported for carbon monoxide and carbon dioxide, nitrogen oxides, sodium nitrite, hydrocyanic acid, carbon disulfide, sulfur dioxide, ammonia, hydrogen peroxide, ethanol, trichloroethylene, carbon tetrachloride, methane, benzene, iodine acetate, cholesterol, benzpyrene, hexobarbitol, zoxazolamine, nembutal, luminal, morphine, adrenalin, persantin, cytochrome c, aldrin, carbaryl, cyclodiene epoxide, and physical influences such as ambient temperature, atmospheric pressure, ionizing radiation, noise, and vibration. A literature review shows that with increasing CO2 and decreasing oxygen concentration in the inhalation air, the toxicity of CO increased in experiments with mice and canaries. Oxides of nitrogen enhance the toxic effect of CO in an additive way and at times synergistically. At 500 m from a metallurgical plant in the USSR the maximum allowable immission concentrations for CO (3 mg/cu m) and SO2 (0.5 mg/cu m) were exceeded. In children residing there a higher normal erythrocyte number, hemoglobin content, and catalase activity were found in the blood along with higher concentrations of coproporphyrin and 17-ketosteroids. All values returned to normal after an 8-week stay of these children away from the metallurgical plant.

61785 **APTIC NO. 80178**

Penney, D. G.

CARDIOVASCULAR EFFECTS OF CARBON MONOXIDE (CO). *In: Survival in Toxic Environments. M. A. Q. Khan and John P. Bederka, Jr. (eds.), New York, Academic Press, 1974, p. 521-533. 60 refs.*

The cardiovascular effects of carbon monoxide in rats were investigated. A CO concentration near or slightly below 100 ppm represents the threshold for measurable polycythemic effects when an animal is exposed continuously over a period of several weeks. The threshold for significant cardiac hypertrophic effects of CO lies between 100 and 200 ppm CO. At 500 ppm CO both the hematologic and cardiac morphologic effects of CO are very pronounced. The heart size of animals continuously exposed to CO increases rapidly and occurs concurrently with the rise in hemoglobin concentration. The polycythemic blood viscosity increase and the resulting greater cardiac work required to propel the blood in CO exposed animals is the major factor in heart weight augmentation.

61786 **APTIC NO. 79722**

Poirier, R., J. P. Kleisbauer, N. Cano, and P. Laval

STUDY OF VARIOUS EPIDEMIOLOGICAL FACTORS OF HIGH RISK CONCERNING PRIMARY BRONCHIAL CARCINOMA. RETROSPECTIVE ANALYSIS OF 416 CASE RECORDS. *(Etude de divers facteurs epidemiologiques et de hauts risques concernant les carcinomes bronchiques primitifs. (Analyse retrospective portant sur 416 dossiers)). Text in French. Rev. Fr Mal. Respir., 2(11):933-940, Nov. 1974. 16 refs.*

An epidemiological study of 416 cases of primary bronchial carcinoma from 1960 to 1972 is reported. The distribution was studied in relation to a certain number of risk factors arbitrarily chosen. The frequency of the risk lay between 67-80%: for the case of atmospheric pollution (67%), for the case of the Hp2 gene (70%), for the age group between 50 and 69 yr (74%), and for smoking more than 10 cigarettes daily (79%). The frequency was 55% in the exposed professions. There was a predominance of age and of smoking over the other factors in considering the risk for the exposed and non-exposed subjects. Each factor is independent of the others and 90% of the patients present at least two associated risks.

61787 **APTIC NO. 79066**

Rabinowitz, Michael, George Wetherill, and Joel Kopple

HUMAN UPTAKE OF DIETARY AND ATMOSPHERIC LEAD: STABLE ISOTOPE AND BALANCE STUDY. *National Science Foundation, Washington, D. C., Research Applied to National Needs, Trace Contam. Conf. Proc. 2nd Annu., Pacific Grove, Calif., 1974, p. 308-315. 15 refs. (Aug. 29-31.)*

NTIS: LBL-3217

Human uptake of dietary and atmospheric lead was investigated by maintaining four healthy adult male volunteers on constant diets selected for their low lead content and supplemented with stable lead isotopes which served as nonradioactive tracers that were distinct from other atmospheric and internal sources of lead. The alimentary absorption rates of both the tracer lead nitrate and food lead varied among individuals by 6-14%. Absorption rates as high as 50% were observed when lead nitrate of sulfide were administered while fasting. The kinetics of lead within the body was adequately described by a three compartment model. Balance considerations and the incomplete labelling of blood by a dietary source indicated a respired input of about 17 micrograms Pb/day (1/3 of the total daily input). This was verified by placing one subject in a room with filtered air and observing the decrease in his blood lead. Facial hair reflected previous blood lead levels. (Author abstract modified)

61788 **APTIC NO. 76298**

Robock, K.

CYTOTOXICITY OF DUSTS. *(Zytotoxizitaet von Staeuben). Text in German. Praxis. Penumol., vol. 28:804-813, 1974. 14 refs.*

Methodological problems of the cytotoxicological study of different silica dusts on alveolar and peritoneal macrophages are discussed, and some results of in vivo studies of silica dusts pretreated in different manners on alveolar macrophages are presented. The investigation of the triphenyltetrazolium chloride reducing activity, and the polarographically determined oxygen consumption of the macrophages show that these parameters are a function of the macrophage volume at constant cell count. Therefore, cytotoxicological tests should be carried out at constant macrophage volume concentration rather than at constant cell count. In vitro experiments with different silica dusts showed that the cytotoxicity, determined from the oxygen consumption and triphenyltetrazolium chloride reducing activity of the macrophages, is dependent on the mechanical pretreatment of the dusts. Correlation was established between cytotoxicity and fibrogenicity. Chemiluminescence measurements during the interaction of macrophages with silica dust revealed electron transfer reactions on the cell membrane.

61789 **APTIC NO. 82534**

Roussel, Andre

HEALTH PROBLEMS OF NUISANCES. *(Les problemes de sante poses par les nuisances). Text in French. Acad. Nat. Med., 158(9):726-730, Dec. 1974.*

In large cities, industries, heating, and automobile exhausts are the main sources of air pollution. It is likely that by acting as respiratory irritants the pollutants predispose to microbial and viral infections. In certain areas, the climate modifies pollutants, making them even more dangerous to certain membranes. Recently, a rise in chronic bronchitis and respiratory insufficiencies has been noted in the U. S., England, and Western Europe. Other pathological phenomena include acute manifestations of respiratory or skin allergies under certain conditions of intense pollution, alterations in children s blood count and delayed ossification of the wrist bones, and conjunctival irritations leading sometimes to corneal ulcerations in smogs such as those observed in high pollution areas. It is also possible that physico-chemical pollution is a factor to bronchio-pulmonary cancers.

61790 **APTIC NO. 81527**

Ryzhovskii, V. L., Y. V. Yelfimova, and M. I. Gusev

THE RESORPTIVE EFFECT OF SMALL CONCENTRATIONS OF METALLIC NICKEL AEROSOL ON THE BODY. *(Rezorbtivnoe deistvie malykh kontsentratsii aerozolya metallicheskogo nikelya na organizm). Gigiena i Sanit., 39(11):8-13, Nov. 1974. 16 refs. Translated from Russian, 12p.*

White male rats were exposed for 3 mo to around-the-clock inhalations of small concentrations of metallic nickel to investigate the chronic resorptive effect of the metal. Metallic nickel aerosol in concentrations ranging from 0.004-0.5 mg/cu m resulted in an inhibition of the oxidation- reduction processes and the central nervous system and an activating effect on the hemogenic system. Changes in the cardiovascular system, disturbances of protein and carbohydrate metabolism and the fermentative system of the body were also observed in addition to changes in the organs and tissues of the experimental animals.

61791 **APTIC NO. 84506**

Soda, K., K. Yamaoka, M. Oseto, A. Yano, and M. Mori

STUDIES ON THE DISTRIBUTION OF PHARYNGEAL VIRUS IN AIR POLLUTED AND NON-POLLUTED AREAS IN EHIME PREFECTURE. *(Ehimeken no taikisoenchiiki oyobi hi-osenchiiki ni okeru into virus no bumpu ni kansuru kenkyu). Text in Japanese. Ehime Kenritsu Eisi Kenkyusho Nenpo (Annu. Rept. Ehime Pref. Inst. Hygiene), no. 36: 12-13, 1974. 1 ref.*

In order to determine whether the frequency of carrying and morbidity of upper airway infectious virus can be an indicator of air pollution, an air pollution area (Niihama) and a non-polluted area (Matsuyama) were chosen to examine the viruses on 30 and 104 children, respectively. At first, in Dec. 1974, Herpes Simplex virus was separated and identified from 3 children in Niihama; Parainfluenza Type 1 virus from 12 children and Herpes Simplex virus from 3 children were separated and identified in Matsuyama. However, in Jan. 1975 no virus could be separated from either area. It was concluded that there is no difference in the state of carrying upper airway infectious virus between the two areas among so small a number of objects. In another survey carried out on the small prevalence of influenza between the winter of 1974 and spring of 1975, separation of infectious virus was successful; however, there was no large difference in morbidity between the two areas except that the frequency of pain in throat was larger in the air-polluted areas than in the non-polluted area.

61792 **APTIC NO. 84445**

Sorber, Charles A., Stephen A. Schaub, and Howard T. Bausum

AN ASSESSMENT OF A POTENTIAL VIRUS HAZARD ASSOCIATED WITH SPRAY IRRIGATION OF DOMESTIC WASTEWATERS. *In: Virus Survival in Water and Wastewater Systems. Joseph F. Malina, Jr. and Bernard P. Sagik (eds.), Austin, Tex., Texas University, 1974, p. 241-252. 23 refs.*

The potential airborne hazard associated with spray irrigation of domestic wastewater is evaluated in terms of human risk to viral disease. The entric virus concentrations of raw wastewater are as high as 6000 plaque forming units/liter; and conventional secondary treatment processes, including chlorination as currently practiced, cannot be expected to reduce the initial virus concentration by much more than 1 log. Models developed for wastewater spray operations indicate that the use of distance is undesirable as a sole design criterion for virus aerosol reduction under many irrigation site conditions. A positive design approach to minimize the virus aerosol risk is to remove or destroy the viruses in the pretreatment process prior to spraying. (Author conclusions modified)

61793 **APTIC NO. 70666**

Suzuki, Shosuke and Tsuguyoshi Suzuki

INTERRELATIONSHIPS OF SOME BIOCHEMICAL INDICATORS OF LEAD ABSORPTION WITH SPECIAL REFERENCE TO SERUM DELTA-AMINOLEVULINIC ACID AND ITS RENAL CLEARANCE. *Ind. Health (Japan), 12(1-2): 37-48, June 1974. 45 refs.*

Some biological indicators of lead absorption from 23 lead smelters were examined three times. During an accidental month s discontinuation of exposure, the mean concentrations of coproporphyrin and delta-aminolevulinic acid in urine decreased to 1/3 and the positive rates of subjective complaints decreased to 1/2. The hemoglobin content, stippled cells, polychromatic cells, reticulocytes, and lead concentrations showed much less improvement, however. Factor analysis of the indicators revealed the concentration of coproporphyrin in urine had a very different character. Ninety-three percent of the data matrix of the indicators were explained by four factors. The mean concentration of delta-aminolevulinic acid in serum was 35.5 + or 11.4 micrograms/dl; the renal clearance and renal reabsorption rates of the substance were 11.2-16.9 ml/min and 92.5-97.5%, respectively, in the six smelter workers admitted for 6 days to a hospital, except for one case. Delta-aminolevulinic acid in serum will never be an excellent indicator of lead absorption, but it may be a key substance when coupled with the delta-aminolevulinic acid and coproporphyrin excretions in the urine. (Author abstract modified)

61794 **APTIC NO. 79647**

Truhaut, R.

CAN PERMISSIBLE LEVELS OF CARCINOGENIC COMPOUNDS IN THE ENVIRONMENT BE ESTABLISHED? *Cancer Epidemiol. Environ. Factors, vol. 3: 50-57, 1974. 13 refs. (Presented at the International Cancer Congress, 11th, Florence, Italy, 1974.)*

The problem of establishing permissible levels for carcinogenic compounds in the environment is discussed. Arguments for and against the theory of no thresholds for carcinogens are reviewed along with practical problems associated with the no thresholds approach. Human carcinogens are discussed in terms of three categories: substances with an assigned threshold limit value, substances known to be potent occupational carcinogens without assigned TLV s, and substances awaiting reassignment of TLV values because of recently discovered carcinogenicity.

61795 **APTIC NO. 82255**

Ueshima, I., M. Tsuda, Y. Takemura, T. Sakata, N. Mizukoshi, and Y. Tsunetoshi

SURVEY ON THE HEALTH EFFECT OF INHABITANTS IN OSAKA PREFECTURE BY AIR POLLUTION. *(Osaka-fuka ni okeru taikiosen no jumin kenkochosa). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):320, Nov. 1974.*

The results of an epidemiological survey of chronic bronchitis among the inhabitants of the southern area of Suita City are described. The subjects were 17,642 inhabitants older than 40, and the items on the survey included BMRC, physical examination, respiratory function, sputum examination, and chest roentgenography. The standardized morbidity of chronic bronchitis was 7.4% in males, 3.5% in females and 5.4% total. The mormidity in Suita was lower than in the Nishiyodogawa Ward of Osaka and the Southern area of Toyonaka City, where the official compensation system for health impairment due to environmental pollution has been applied. The ratio of patients suffering obstructive disturbance among the chronic bronchitic patients was 16.6%, nearly the same as the results obtained previously.

61796 **APTIC NO. 82336**

Waller, R. E., A. G. F. Brooks, and M. W. Adler

RESPIRATORY SYMPTOMS AND VENTILATORY CAPACITY IN A COHORT OF LONDONERS BORN IN 1952-3. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 77-90. 13 refs. (June 24-28.)*

Respiratory symptoms and ventilatory capacity were studied among two samples of Londoners, one born during 1952, before the London fog of December, 1952, and the other born during 1953, just after it. In the first stage of the study 800 Londoners reaching age 18 in 1970, who were exposed in the neonatal period to very high concentrations of pollutants during the fog, were examined, using a questionnaire on respiratory symptoms. Ventilatory capacity was also measured, using a portable spirometer and a peak flow meter. A further 800 subjects reaching age 18 in 1971, and thus not exposed to the 1952 episode, were examined in the same way in the second stage. No differences were found in the prevalence of respiratory symptoms, nor in the mean values of respiratory function measurements, between subjects born before the fog and those born after it. Respiratory symptoms were much commoner among the smokers than among the nonsmokers, and there were small differences in ventilatory capacity between these categories. The main factor associated with lowered ventilatory capacity was a history of respiratory illness, and in view of earlier findings, this may indicate an indirect long-term effect of exposure to pollutants. (Author abstract modified)

61797 **APTIC NO. 84443**

Walton, W. H.

AIRBORNE PARTICLES AND HEALTH. *In: Dust Control and Air Cleaning. R. G. Dorman, New York, Pergamon Press, 1974, Chapt. 1, p. 1-29. 50 refs.*

A general review of the relationship of airborne particles to human health is presented. Topics covered include: definitions of dust, fume, smoke, and mist; the size distribution and dispersion of dusts; the mechanics of particle inhalation and deposition in the lung; respiratory dust cleansing mechanisms; dust-retention characteristics of the lungs; the measurement of respirable dust; and the occurrence of pneumoconiosis and allied diseases as a result of occupational exposure to dust.

61798 **APTIC NO. 82090**

Watanabe, Hiromu and Hisako Murayama

A STUDY ON HEALTH EFFECT INDICES CONCERNING POLLUTION IN CADMIUM- POLLUTED AREA. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 91-104. (June 24-28.)*

Cadmium pollution health effect surveys were made on inhabitants 30 years old or more in the areas of Japan where rice contained over 0.4 ppm Cd and in adjacent areas. All subjects belonged to farm families and ate rice produced in the areas where they lived as a staple food. Areas were classified as high-polluted where 0.6 to 1.0 ppm Cd was detected in unpolished rice. The copper concentration in this rice was about 6 ppm. Areas were classified as low-polluted where around 0.3 ppm Cd was detected in unpolished rice. The copper concentration in this rice was about 3 ppm. Areas with no Cd environmental pollution and less than 0.1 ppm Cd in unpolished rice were classified as nonpolluted. Cadmium metabolism was classified into stages by urinary Cd excretion and tubular function. No abnormal increase of urinary Cd excretion occurred during the accumulation stage. This stage occurred during school age in low and high polluted areas. An increase of urinary excretion of low molecular weight protein was not clear during the saturation stage, and urinary Cd excretion increased. This stage occurred during adulthood in low polluted areas. A sharp increase of urinary excretion of Cd, Cu, and low molecular weight protein occurred during the former term of the excretion stage. Excretion of low molecular protein in urine was still clear in the latter term of the excretion stage, but Cd excretion in urine tended to decrease. The excretion stage occurred during adulthood in high polluted areas. Lysozyme, beta 2-M G and Proline in urine served as indices for tubular dysfunction. The female apparently had another accelerating factor affecting development of tubular dysfunction by Cd intake. Tubular disorder due to intake of Cd polluted rice was accelerated by aging. The cadmium level in urine was apparently reflected by the Cd level in blood. Copper level in urine was not related to that in blood. The significance of Cu intake in causing tubular dysfunction cannot be ignored. (Author abstract modified)

61799 **APTIC NO. 81767**

Wenzel, Duane G. and Barry L. Reed

MEASUREMENT OF LYSOSOMAL FRAGILITY PRODUCED BY HYPOXIA, NICOTINE, CARBON MONOXIDE, AND HYPEROXIA IN CULTURED ENDOTHELIOID CELLS. *Res. Commun. Chem. Pathol. Pharmacol., 7(4):745-754, April 1974. 18 refs.*

Hypoxia, nicotine, carbon monoxide, and hyperoxia were evaluated for their potential labilizing effects upon lysosomes of cultured rat heart endothelioid cells. All of the treatments proved toxic in terms of a reduction in cell number, although only nicotine and hyperoxia significantly labilized the lysosomes. The increased lysosomal permeability produced by nicotine was followed by extensive cellular vacuolation. Hyperoxia effected a similar change in the permeability of the lysosome, but the increase was rapidly followed by cell death. The growth inhibitory action of carbon monoxide on the endothelioid cells was not preceded by a detectable actue effect on the lysosome. Exposures to 75 and 95% carbon monoxide which resulted in growth inhibitory effects did not produce detectable lysosomal changes. (Author abstract modified)

61800 **APTIC NO. 80177**

Wiebel, Friedrich J., James P. Whitlock, Jr., and Harry B. Gelboin

MAMMALIAN ARYL HYDROCARBON HYDROXYLASES IN CELL CULTURE: MECHANISM OF INDUCTION AND ROLE IN CARCINOGENESIS. *In: Survival in Toxic Environments. M. A. Q. Khan and John P. Bederka, Jr. (eds.), New York, Academic Press, 1974, p. 261-293. 57 refs.*

The distribution of different forms of aryl hydrocarbon hydroxylases in experimental animals and the mechanism of induction in mammalian cells in culture were investigated. Induction requires continuous protein synthesis and transitory RNA synthesis. The synthesis, transfer, and function of induction-specific RNA is independent of concurrent ribosomal RNA synthesis. Enzyme activity is regulated at the post-transcriptional level. The relative importance of transcriptional and post transcriptional control mechanisms varies between different cell types. Using the synthetic flavonoid 7,7-benzoflavone as a probe, at least two forms of aryl hydrocarbon hydroxylase can be distinguished. The relative activities of these two forms varies with the age, sex, state of induction, nutrition, and tissue of animals. Microsomal oxygenases convert polycyclic hydrocarbons not only to inactive metabolites, but also to derivatives which are toxic and carcinogenic. (Author abstract modified)

61801 **APTIC NO. 82458**

Wilson, Knud

LUNG CANCER IN STRANDBY (FREDERIKSHAVN). *(Lungecancer i Strandby (Frederikshavn)). Text in Danish. Ugeskr. Laeg., 136(45):2551-2552, Nov. 1974.*

Data on the incidence of lung cancer in Strandby, a village of 2000 in Denmark is presented. An asphalt plant emitting smoke and dust is the only source of industrial air pollution. Due to the dominant winds, the emissions are entrained over the residential area. The lung cancer incidence; 1 case in 1968, 1971 and 1974 each, and 2 cases in 1973, are higher than in Copenhagen. All lung cancer patients were men, with different occupations, and 5 of them were smokers. They were aged 47-69 yr. Chronic bronchitis was observed in one of these victims. The first case of lung cancer occurred 14 yr after the asphalt plant was put into operation. It is planned for shutdown in 1975.

61802 **APTIC NO. 79887**

Yeh, H. C., A. J. Hulbert, R. F. Phalen, and O. G. Raabe

MATHEMATICAL CONSIDERATIONS FOR PARTICLE DEPOSITION IN THE TRACHEOBRONCHIAL TREE: EQUATIONS AND LUNG MODEL. *In: Inhalation Toxicology Research Institute Annual Report. Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., Inhalation Toxicology Research Inst., Atomic Energy Commission Contract AT(29-2)-1013, Rept. LF-49, p. 298-302, Dec. 1974. 8 refs*

A geometrical lung model generated by a Monte-Carlo technique is described for the theoretical study of particle deposition in the human respiratory tract. The model possesses two main advantages over existing lung models: lung characteristics reflect actual lung morphometry rather than requiring an oversimplified regular tree-like lung structure, and particle deposition in each lobe of the lung can be calculated separately. A set of equations for deposition calculations is chosen based on a consideration of the flow inside the respiratory tract. (Author abstract modified)

61803 **APTIC NO. 70718**

Osaka Prefectural Inst. of Public Health (Japan), Lab. of Environmental Health

ALTERATION OF BLOOD CELLS AND SERUM ALKALINE PHOSPHATASE OF MICE RESPECTIVELY EXPOSED TO OZONE AND PHOTOCHEMICAL OXIDANT. *(Ozon oyobi kokagaku okishidanto bakuro-mausu no kekkyu narabini kessei-arukarihosufataze no hendo showa 47 nendo). Text in Japanese. In: Kokagaku Sumogu ni Kansuru Chosakenkyu No. 1 Osaka-fu, 1974. p. 298-308, Feb. 1974.*

Both sexes of JCL-ICR mice aged 3.5 and 6 weeks were exposed to ozone at 3-10 ppm for 1-3 hr. Another group of the same strain of female mice aged 3 weeks were exposed to artificially generated photochemical oxidant at 0.5-0.1 ppm for 2 hr/day, 5 days/wk for 1-3 mo. The acute symptoms of ozone were rapid increased of red blood cells (RBC) in both sexes not restored to the original value for 1 day; increase of white blood cells (WBC) more rapid in males than females, restoring to the original value in males after 1 day and not restoring in females; the ratio of neutrocyte to lymphocyte increased in some animals; and without the individual value of WBC, no significant difference the average amount of erythrocyte pigment between those exposed and unexposed occurred. Alkaline phosphatase activities, both basic type and magnesium-activated type, decreased just after exposure and were restored after 1 day. The chronic symptoms of photochemical oxidant were: decrease of RBC and WBC; increase of frequency of higher WBC index without the individual value of WBC; some increase of average erythrocyte pigment; and decrease of both types of serum alkaline phosphatase activity.

61804 **APTIC NO. 76308**

RESPIRATORY DISEASES OF OUR TIME. *(Le malattie respiratorie del nostro tempo). Text in Italian. Lotta Tuber. Mal. Polm. Soc., 44(1):11-24, 1974. 4 refs.*

During the past few decades, there has been a notable increase in the incidence of lung cancer and other respiratory diseases. Reasons for this increase center around a prolonged life expectancy, a rise in harmful substances in working environments and cities, an increase in smoking, and alterations induced by chemotherapies and antibiotics on bacteria. While lung cancer is the most feared and most publicized respiratory disease, chronic bronchitis and emphysema are no less serious. Chronic bronchitis is characterized by an abnormal increase in the volume of mucous secretions. Chronic bronchitis mortality in Italy has gone from 5343 in 1951 to 15,807 in 1970. Air pollution, cigarette smoking, and infectious agents are the main causes. Emphysema is an advanced stage of chronic bronchitis, which affects people over 50 who have had bronchitis. Lung diseases can affect heart function and the reverse is also true, due to close anatomical and functional connections between the heart and the lungs. It is imperative that attitudes change toward the importance of the environment, the hazards to workers in modern industrial and commercial installations, and cigarette smoking. Preventive action on a medical, individual, collective, and educational basis must be undertaken.

61805 **APTIC NO. 79983**

Funabashi City Office (Japan), Div. of Environmental Pollution Control

INVESTIGATION OF HUMAN EFFECTS BY CADMIUM FROM TEIKOKU DENSHI- KOGYO. *(Teikoku denshi kogyo ni kakawaru cadomium no jintaieikyo chosa). Text in Japanese. In: Report on Environmental Pollution in Funabashi City, p. 20, 1974.*

In order to investigate the effects on humans of dust containing cadmium, the 90 people who live within a radius of 100 m from a factory (Teikoku denshi Ind. Co.) will be medically examined on Oct. 7, 1973. The examination includes history taking, a general examination, blood pressure, and urinalysis consisting of pH, sugar, protein, occult blood, and cadmium determination. The examination had not been conducted at the time that this preliminary report was issued.

61806 **APTIC NO. 82436**

Musashino Municipal Office

RESULTS OF HEALTH EXAMINATION CONCENTRATING AIR POLLUTION. *(Kogai kenkoshindan jisshi jokyo). Text in Japanese. Musashino-shi No Kogai (Environ. Pollut. Musashino), vol. 1974:56-65, 1974.*

In order to investigate the effects of auto exhaust on humans annual health examinations have been carried out in Musashino City. The results of a health examination in 1974 on 178 inhabitants (47 men and 131 women) older than 18 and living by heavily traveled roads are given. About 60% of the examined persons had some disease, such as slight anemia, hypertension, or bronchitis. The number of persons needing some care or caution was highest in the forties, followed by the thirties and the fifties; the need for medical care was most common in the fifties and sixties. The number of persons diagnosed as needing to be careful due to respiratory symptoms was 28 (16%), as compared to 16 (9%) in 1973. Of these 28 patients, 15 lived in the city for more than 20 years and 7 for less than 5 years, showing the relationship between the morbidity of respiratory symptoms and the length of residence in the city.

61807 **APTIC NO. 84006**

AIR POLLUTION, CIGARETTE SMOKING, AND ARTERIOSCLEROSIS. *(Polucion, aerea, cigarillo y arteriosclerosis). Text in Spanish. Medicina (Buenos Aires), 34(3):276-279, May-June 1974.*

Experiments linking exposure to carbon monoxide to the development of arteriosclerosis and other arteriopathies in humans and animals are reviewed. Experiments with animals did not support the arteriopathic effect of nicotine. In rabbits subjected to much higher dosages of nicotine than is the hardened smoker, only necrosis and calcification of the cells developed. Thus something apart from nicotine in cigarettes, causes arteriosclerosis. Carbon monoxide is produced by the incomplete combustion of the tobacco and paper. The CO unites with hemoglobin to form carboxyhemoglobin. Rabbits with 10% carboxyhemoglobin have edema of the arterial intima, various arterial degenerations, an increase in collagen and of mucopolysaccharides and formation of fibrous plaques. The content of cholesterol in the aortas of high CO environment rabbits, increases from 2 to 5 times when their diet includes cholesterol. CO is also produced by the combustion of car engines. In Los Angeles, in the peak hours of summer mornings, in people with angina who have driven 90 minutes in traffic, there is a 5% level of carboxyhemoglobin. Even 2 hours later, the concentration of carboxyhemoglobin has lessened to only 2.9%. Thus people with angina trouble are more sensitive to the injurious effects of CO. The incidence of lung cancer in industrialized countries is increasing not so much because of cigarettes, but because of the increase in air pollution. Therefore, it is incumbent upon the technology of the industrialized countries to perfect combustion methods of machinery as well as cars, so that carbon dioxide instead of CO is produced. It is also incumbent upon the media to emphasize the deleterious effects of air pollution and smoking, and not to bow to the pressure of big business by lessening their attack.

61808 **APTIC NO. 84639**

Regional Office of Countermeasures Against Environmental Pollution, Kanto, Air Pollution Section

STATES OF HEALTH INJURY SUSPECTED TO BE DUE TO PHOTOCHEMICAL SMOG. *(Kokagaku smog ni yoru to utagawareru kenkohigai no jokyo). Text in Japanese. In: Office Report of Cooperative Survey on Photochemical Smog in Tokyo and Three Prefectures, Chiba, Saitama and Kanagawa (1973). 102p., April 1974.*

The number of notifications submitted by persons injured due to photochemical smog in Tokyo and Kanagawa, Chiba, and Saitama prefectures was 4035, 2526, 164, and 6774 respectively, in 1973 (from April to Oct.); and 8437, 1383, 561, and 5726 in 1972, and 28,223, 13,183, 1169 and 3663 in 1971. In Tokyo, Chiba, and Kanagawa the numbers show a yearly decrease, while in Chiba there is an increase. Although it is thought to be due to the invasion of air pollution into inland parts, the decrease of the number of notifications does not necessarily correspond to the reduction of air pollution. July 1973 was the month with the most notifications. No notification was submitted on the day when the maximum concentration of oxidant did not reach the standard value of 0.06 ppm. In Kanagawa, the threshold value was 0.15 ppm.

1973

61809 **APTIC NO. 82707**

Abidin, B. I., V. V. Kustov, V. I. Belkin, and L. T. Poddubnaya

INFLUENCE EXERTED ON THE ANIMAL BODY BY CONTINUOUS AND DISCONTINUOUS EXPOSURE TO CARBON MONOXIDE. *(Vliyanie na organizm zhivotnykh nepreryvnogo i preryvistogo vozdeystviya okisi ugleroda). Text in Russian. Kosmich. Biol. Med., 7(4):17-21, July-Aug. 1973. 13 refs.*

Eighty-four white male rats weighing 120-150 g were subjected to continuous 30-day exposure to carbon monoxide at a concentrtion of 0.047 + or - 0.02 mg/l or to 4-hour daily exposure to a concentration of 0.34 + or - 0.12 mg/l for 30 days. A third group of control rats breathed room air. The overall behavior of the experimental animals did not differ from the behavior and general state of the control animals. However, the first two groups gained weight more slowly than the third group. Continuous and intermittent exposure had a similar effect in most respects. The data indicate that a coefficient of not less than 3 should be used in computing the value of the maximum permissible concentration of CO for its continuous effect on the basis of the industrial maximum permissible concentration.

61810 **APTIC NO. 81939**

Amdur, Mary O.

ANIMAL STUDIES. *National Academy of Sciences and National Research Council, Washington, D. C., Assembly of Life Sciences, Health Eff. Air Pollut. Conf. Proc., 1973, p. 175-205. 30 refs. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

Experimental toxicology s constributions to understanding of air pollution and their relationship to findings in atmospheric chemistry and epidemiology are discussed. Acute effects of sulfur dioxide include reversible increase in flow resistance of lungs and airways. The increase from 0.26 ppm is less than differences among individuals. No significant increase occurred in animals exposed to inert aerosols. Hypersensitivity is discussed. Sulfur dioxide below 1 ppm readily penetrates the upper airway. Chronic SO2 effects in rats are discussed. Increase in flow resistance is not a chronic effect. Experiments on monkeys are described. Dogs are more sensitive than guinea pigs to chronic exposure. Particle size is as important as concentration in inhalation exposures. Sulfur dioxide can change to sulfuric acid and sulfate salts. Partial conversion of low SO2 levels to H2SO4 increases response. Not all sulfates are irritant in guinea pigs. Combinations of SO2 and aerosols of metal salts are discussed. Animal exposures indicate how much SO2 becomes H2SO4. Aerosol and SO2 effects differ with types of biological reaction.

61811 **APTIC NO. 79265**

Antweiler, H.

CHEMICAL-PHYSICAL NOXAS BY ATMOSPHERIC CONTAMINATION. *(Chemisch-Physikalische Noxen durch Verunreinigung der Atmosphaere). Text in German. Verh. Deut. Ges. Ind. Med., no. 79:38-46, 1973. 18 refs.*

Studies and observations on the effects of air pollutants on the organisms are reviewed. Organisms havve different means of protection against inhaled air pollutants, e.g., removal by the ciliated epithelium or the blood and lymph system, detoxification by enzymatic metabolism, such as in the case of polycyclic aromatic hydrocarbons, neutralization, or incorporation in tissues. Statistically evaluated epidemiological data show a correlation between sulfur dioxide and particulate matter and diseases of the respiratory tract, such as emphysema and bronchitis. Increased susceptibility to infections was observed in animals exposed to low concentrations of SO2, nitrogen dioxide, and ozone. At present, there are no real dangers of acute lead poisoning, but the further increase of the lead concentrations in the air may lead to hazardous lead levels in the bones. Asbestos, whose carcinogenicity is mainly due to its needle-shaped particles, has become a practically ubiquitous air pollutant in urban areas, and especially in the neighborhood of asbestos processing plants. Since no exact dose-effect relationships are known with respect to carcinogenic substances, the concentration of carcinogens in the atmosphere should be reduced to the lowest possible level.

61812 **APTIC NO. 83417**

Brandt, R. H., B. Freigang, and B. Christoph

COMPARATIVE INVESTIGATIONS OF THE EXHALATION RATE OF U. S. AEROSOLS AND ELECTRIC AEROSOLS. *(Vergleichende Untersuchungen zur Exhalationsquote von US-Aerosolen und Elektroaerosolen). Text in German. Z. Physiotherapie, 25(1):47-51, Jan.-Feb. 1973. 18 refs.*

Aerosols are generally applied in therapeutic and diagnostic techniques aimed at respiratory disorders. Examinations on 10 patients helped determine absolute values for exhalation rates, comparing U. S. aerosols and electrostatically charged aerosols. To determine mist density of expired air, an electrostatic filter, chemical filter and a mechanical paper filter were used. Exhalation rates were calculated to be 25%, which may be reduced to 1/3 (9%) by electrostatic charging of aerosol particles.

61813 **APTIC NO. 84472**

Bruaux, P., F. Claeys, R. De Boeck, A. Lafontaine, and Y. Swyngedouw

EPIDEMIOLOGICAL ASPECTS OF LEAD ENVIRONMENTAL POLLUTION. *(Quelques aspects epidemiologiques de la pollution de l environnement par le plomb). Text in French. Ann. Gembloux, 79(2):69-84, 1973. 44 refs.*

In the human organism, lead is mainly absorbed by the digestive and respiratory systems. Once distributed throughout the organism, it tends to bind to bony tissue; about 9% of lead is found in the bones. Physiopathological symptoms are usually precursors to osteoporosis and also to the liberation of lead from the bony tissue. Lead will interfere with the biosynthesis of heme, inhibit ATP of the erythrocyte membrane, increase the oxalo-acetic and glutamopyruvic transaminases, reduce alkaline phosphatase and erythrocyte cholinesterase activity, increase catalase activity, decrease carbonic anhydrase activity, cerebral ALA dehydratase, and thyroidal activity, and inhibit the utilization of glucose by the cerebral tissue. Lead is mainly eliminated through the feces. It is discharged into the atmosphere mainly through exhausts. In rural zones, the monthly average does not exceed 0.5 microgram/cu m. In residential areas and small conglomerations, the monthly average remains inferior to 1 microgram/cu m; in the traffic areas of these same zones, the monthly average of 3 microgram/cu m is not exceeded. In large industrial urban zones, and in their residential areas, the monthly average is less than 2 microgram/cu m, with daily averages sometimes reaching 8 microgram. In intense traffic areas, the monthly average is inferior to 10 microgram. It is thought that the average absorption/day through respiration is 6 microgram. The health risks of lead pollution will remain difficult to determine until tolerance limits are established.

61814 **APTIC NO. 81762**

Cameron, Paul and Donald Robertson

EFFECT OF HOME ENVIRONMENT TOBACCO SMOKE ON FAMILY HEALTH. *J. Appl. Psychol., 57(2):142-147, April 1973. 6 refs.*

The effect of exposure to tobacco smoke in the home on family health was evaluated from a random phone sample of 2626 households in Detroit, Long Beach, and Pasadena. Children subjected to tobacco smoke in the home showed a greater prevalence of acute illness when compared to children in smoke-free environments. Chronic illness prevalences for children subjected to smoke were similar to those for children not subjected to tobacco smoke. Adult nonsmokers exposed to tobacco smoke in the home exhibited a somewhat less significant greater prevalence of acute illness than adult nonsmokers in smoke-free environments. Respiratory illness rates also appeared to be possibly related to air pollution rates in metropolitan areas. (Author abstract modified)

61815 **APTIC NO. 81936**

Carnow, Bertram W.

SULFUR OXIDES AND PARTICLES: EFFECTS ON HEALTH. *National Academy of Sciences and National Research Council, Washington, D. C., Assembly of Life Sciences, Health Eff. Air Pollut. Conf. Proc., 1973, p. 263-309. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

Sulfur dioxide and particulates appear to accelerate and exacerbate disease in those at high risk, in addition to any primary or long term effects. Mortality was studied during one month in Chicago by comparing deaths from all causes in each sq mi of the city on the 10 days of low, medium, and high pollution, as measured in that sq mi. These were summed for the entire city. Highly significant positive results were found in males 55 yr and older, for respiratory deaths and deaths from cardiovascular diseases. The data suggest that in Chicago during that month, some excess cardiac deaths were significantly related to pollution levels. Deaths from all causes during a 9 day pollution episode were compared with deaths in the same area of the city 9 days before, 9 days after, and 9 days representing an expected 3 mo average for the season. Deaths from influenza, bronchitis, and pneumonia increased in the white male population by almost 100% during the episode in the high SO2 area. Mortality from cardiovascular diseases was significantly elevated for males. The number of bronchitic hospital admissions increased during the episode. Some striking increases in mortality were also observed in certain subgroups of females in the high pollution areas. There was also a substantial increase in ischemic heart disease in females in the moderate pollution section. There was no significant increases in the low pollution areas during the episode over what might normally be expected as compared to before and after the episode.

61816 **APTIC NO. 79981**

Cavalleri, A.

POLLUTION BY CHROMIUM. *(L inquinamento da cromo). Text in Italian. Med. Lavoro (Milan), 64(3-4):127-131, March-April 1973. 31 refs.*

In industrialized countries, chromium is a recognized atmospheric pollutant which, along with its compounds, easily enters the human organism in dangerous quantities either through air, water, or food. The toxicity of chromium and its compounds affects the organism in numerous ways; it is thus necessary to determine its exact effects with respect to concentrations, chemical structure, and mode of introduction. In small quantities, chromium is important to mammals for the metabolism of lipids and glucides; in high concentrations, it is toxic to humans; it precipitates proteins and nucleic acids, and interferes with enzymatic mechanisms. Once absorbed, it attaches itself to transferin, albumin, and gamma-globulin and is deposited in the lungs, bones, liver, spleen, and kidneys. It irritates skin and mucosa and provokes renal lesions. When intake of chromium and its compounds does not cause tumors, a high incidence of inflammatory and fibrous phenomena and the appearance of granular lumps is common among various animal species. It is imperative that more data be obtained on chronic intoxication of animals and man for low dosages and for the many modes of intake, and on the effects of accumulation in the organism and possible synergistic interaction with other atmospheric pollutants.

61817 **APTIC NO. 81949**

Coufal, K., O. Palka, and J. Krchnakova

CHRONIC BRONCHITIC INCIDENCE IN THE RURAL POPULATION OF BLANSKO DISTRICT. *(Chronicka bronchitida mezi venkovskym obyvatelstvem v okresu Blansko). Text in Czech. Stud. Pneumol. Phtiseol. Cech., 33(7):453-465, 1973. 38 refs.*

Chronic bronchitis was studied among 10,693 adults in a rural environment. A correlation was demonstrated between chronic bronchits and age: for males between 15 and 39 yr 7.5% chronic bronchitis (CHB), aged 40 to 64 yr 24.3%, aged 65 and over 24.7%; and for females in the identical age groups corresponding figures were 1.1%, 8.1%, and 7.4% CHB. The incidence of CHB was significantly higher in cigarette smokers as against non-smokers and ex-smokers. Using standardization limiting results to the group of non-smokers, correlations between CHB frequency were demonstrated for age, occupational dust exposure, and to a limited degree, atmospheric pollution, but not sex. Incidence of the obstructive type of chronic bronchitis was correlated to smoking, age, and occupational dust exposure, but not sex or atmospheric pollution. There was a higher incidence of CHB among persons with a previous history of pneumonias or a family history of pulmonary emphysema or asthma. Third or fourth degree shortness of breath, wheezing, or daylong cough and expectoration indicate a significantly higher frequency of CHB.

61818 **APTIC NO. 67161**

Davies, C. N.

THE DEPOSITION OF AEROSOL IN THE HUMAN LUNG. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 90-99. 46 refs. (Oct. 17-18.)*

The deposition of airborne aerosols in the human lung during steady breathing is discussed. Recent experiments show that the deposition can be as low as 10-15% for particles in the size range 0.5i1.0 micron diameter. There is practically no difference between the deposition of 0.5 micron and 1.0 micron particles during steady breathing. Sedimentation is responsible for deposition upon the alveolar wall, but is is not the rate determining factor. The mechanical mixing of tidal and reserve air in the 200 cu cm of dead space is responsible. Particles of extreme shape such as asbestos fibers and hygroscopic particles like tobacco smoke are health hazards. The coarser types of asbestos fibers are responsible for bronchial carcinoma and asbestosis, which do not require penetration of asbestos fibers to the alveoli. If particles of smoke of 0.2 to 0.5 micron size are inhaled and increase in size to 2 or 3 micron diameter by absorbing moisture while in the lung airways, they will readily deposit on the bronchial epithelium and present the risk of bronchial carcinoma.

61819 **APTIC NO. 81522**

Davydova, T. B.

THE INFLUENCE OF TETRAMETHYLTHIURAM DISULFIDE ON THE ESTROUS CYCLE AND GENITAL FUNCTION OF ANIMALS WHEN INHALED. *(Vliyaniye tetrametiltiuramdisul fida na estral nyy tsikl i detorodnuyu funktsiyu zhivotnykh pri ingalyatsionnom vozdeystvii). Gigiena i Sanit., 38(4):108-110, 1973. 3 refs. Translated from Russian, 7p.*

The effects of the chronic inhalation of low concentrations (0.45-3.8 mg/cu m) of tetramethylthiuram disulfide on the estrous cycle and genital function of sexually mature female albino rats were investigated. The animals were dosed dynamically for 6 hr/day, five times a week for 4.5 mo. Chronic inhalation resulted in disturbances in the estrous cycle which were manifested by an extension of the cycle in favor of the dormant phase during the first period of treatment. The effects were more pronounced when the higher concentration (3.8 mg/cu m) was used. Despite the restoration of the estrous cycle at the end of the experiment, the genital function of the animals was disturbed after chronic treatment with TMTD. This disturbance was manifested by a reduction in the capacity to conceive, a reduction in fertility, and lower fetus weights. (Author conclusions modified)

61820 **APTIC NO. 79980**

Favino, A. and G. Catenacci

POLLUTION BY FLUORINE. *(L inquinamento da fluoro). Text in Italian. Med. Lavoro (Milan), 64(3-4):132-142, March-April 1973. 36 refs.*

Fluorine pollution is caused by the discharge of gas, liquid, and solid effluents from industries using fluorine compounds which are extremely stable, and by substances contaminated by fluorine. Chronic intoxication of organisms is related to the liberation of soluble ionic F, which is absorbed in the digestive tract: insoluble compounds are significantly less harmful. Acute intoxication centers in the respiratory tract and is expressed, in the case of inorganic compounds, by severe lesions of the lung cells, and in the case of organic compounds, by major pulmonary clearance with a high Ostwald coefficient. In general, damaging effects on biological structures manifest themselves as multiple and diffuse lesions of an abiotrophic type and an irreversible nature. It affects the growth of vegetation and the fertility of animals, in which it produces considerable deformities; skeletal deformations have already been observed in children from Japanese industrial areas.

61821 **APTIC NO. 82734**

Ferris, Benjamin, Jr.

CHRONIC BRONCHITIS AND EMPHYSEMA. *Med. Clin. N. Am., 57(3): 637-649, May 1973. 27 refs.*

An epidemiological review of factors affecting the development of chronic bronchitis and emphysema is presented. Cigarette smoking appears to be an important causative factor in the development of chronic bronchitis and emphysema, with the intensity of symptoms depending on the degree of inhalation. Air pollution consisting of sulfur dioxide and suspended particulates is also probably a factor in the development of chronic nonspecific lung disease, especially the advanced form of chronic bronchitis known as the complex syndrome. The possibility also exists that children exposed to significant levels of air pollution from fossil fuels may suffer sufficient lung damage to make them more susceptible at a later age to the development of either chronic bronchitis or emphysema. The role that genetic factors play in the development of bronchitis and emphysema is not yet resolved. Evidence does exist to show a correlation between occupational exposure to sulfur dioxide, chlorine, and chlorine dioxide and airway obstruction.

61822 **APTIC NO. 75333**

Goldsmith, John R.

HEALTH AND ANNOYANCE IMPACT OF ODOR POLLUTION (FINAL REPORT). *California Dept. of Health, Berkeley, Calif., Environmental Protection Agency Contract 68-02-0083, Program Element 1AA005, Rept. EPA-650/1-75-001, 380p., Oct. 1973. 54 refs.*

Several field studies were conducted to determine health and annoyance reactions to community odor from industrial sources. Questionnaires were used to collect information from respondents on exposure to odor and on health and annoyance reactions. The health reaction sectioon of the questionnaire included a symptom checklist and the basic questions from the British Medical Research Council s questionnaire on respiratory symptoms. Exposure to odor was also measured by dynamic olfactometry. The frequency with which odor was noticed and the frequency and intensity with which respondents were annoyed by the odor were generally correlated with odor intensity and frequency as measured by dynamic olfactometry within each community. Symptoms showing significant differences by exposure in at least one community study included dizziness, nausea, vomiting, headache, runny nose, cough, sinus congestion, nose irritation, and chest pain as well as the MRC symptoms of persistent cough and/or phlegm and shortness of breath. (Author abstract modified)

61823 **APTIC NO. 80622**

Goldstein, Elliot

EVALUATION OF THE ROLE OF NITROGEN DIOXIDE IN THE DEVELOPMENT OF RESPIRATORY DISEASES IN MAN. *National Academy of Sciences and National Research Council, Washington, D. C., Assembly of Life Sciences, Health Eff. Air Pollut. Conf. Proc., 1973, p. 407-460. 89 refs. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

The available knowledge concerning the relationship of exposure to oxides of nitrogen and respiratory diseases is reviewed. Effects on animals, sources of nitrogen dioxide, and acute exposures in man are discussed. The significance to human health of presently encountered atmospheric NO2 levels is unknown. Anatomical differences make interpretation of animal experiments that is relevant to disease in man exceedingly difficult. Pathological abnormalities in laboratory animals following NO2 exposure are discussed. The NO2 depresses pulmonary resistance to infection in mice. It appears to inhibit alveolar macrophage function. Experimental methods for measuring the effect of NO2 on mucociliary function are described. Nitrogen dioxide appears to affect immune reactions in preliminary studies. Biochemical abnormalities following NO2 exposure are discussed. Raising the air quality standard to 0.08 ppm NO2 on an annual basis or changing to a 0.35 to 0.50 ppm hourly standard is recommended. The normally occurring atmospheric nitrous oxide level, 0.50 ppm, is considerably below the threshold concentration for a biological effect, and the potential toxicity of this gas as a pollutant is nil. Although nitric oxide is a principal component of photochemical smog and accounts for a major portion of the oxides of nitrogen, its biological toxicity is of such low magnitude that it is not a hazard to health. The chemical instability of higher oxides of nitrogen precludes the likelihood of their causing significant hazard in other than acute circumstances. Of the oxides of nitrogen, only nitrogen dioxide is a significant hazard to health.

61824 **APTIC NO. 67165**

Heyder, B., L. Armbruster, J. Gebhart, and W. Stahlhofen

DEPOSITION OF AEROSOL PARTICLES IN THE HUMAN RESPIRATORY TRACT. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 122-125. 32 refs. (Oct. 17-18.)*

The investigation of the deposition of aerosol particles in the human respiratory tract is reviewed. Deposition of monodisperse di-2-ethylhexyl sebacate droplets was determined as a function of the modal droplet diameter and breathing pattern, i.e., tidal volume and frequency of breathing. When the flow rate was constant at 250 cm/sec, the average residence time of the aerosol in the respiratory tract increased from 1 to 8 sec. When the tidal volume was kept constant at 1000 cu cm, the frequency was changed from 30 to 3.7/min. The deposition decreased with increasing flow rate. When the breathing frequency was kept constant at 30/min, and the tidal volume was changed from 250 to 200 cu m, the residence time was constant, but the flow rate of the inhaled aerosol varied by a factor of 4. Changes in the lung geometry with increasing tidal volume had no influence on the deposition of aerosol particles.

61825 **APTIC NO. 81937**

Higgins, Ian T. T. and Benjamin G. Ferris, Jr.

EPIDEMIOLOGY OF SULPHUR OXIDES AND PARTICLES. *National Academy of Sciences and National Research Council, Washington, D. C., Assembly of Life Sciences, Health Eff. Air Pollut. Conf. Proc., 1973, p. 227-261. 107 refs. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

There is a good evidence that exceptional episodes of pollution cause morbidity and mortality. Variations of lung function over time are discussed. Effects of pollution may also be studied by geographical comparisons. Several international comparisons are discussed. High levels of pollution were associated with more frequent respiratory symptoms among smokers in comparisons between urban and rural areas. Health comparisons within occupational groups are described. Comparisons between towns are also discussed. Comparisons have also been made between areas with different levels of air pollution within a large city. While pollution s major effects are on those already suffering from disease, evidence, especially studies of children, suggests that pollution can also initiate disease. Recent studies do not justify changing current sulfur dioxide standards. Average annual concentrations of 80 to 100 micrograms/cu m for particles and SO2 and daily averages of 250 microgram/cu m for particles and 500 microgram/cu m for SO2 should probably not be exceeded. Evidence suggests that particulates and SO2 contribute to the toll of lung cancer. (Author abstract modified)

61826 **APTIC NO. 81938**

Horvath, Steven M.

EFFECTS OF CARBON MONOXIDE ON HUMAN BEHAVIOR. *National Academy of Sciences and National Research Council, Washington, D. C., Assembly of Life Sciences, Health Eff. Air Pollut. Conf. Proc., 1973, p. 127-144. 41 refs. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

There is a strong suggestion that the effects of carbon monoxide on performance are most severe when individuals are already required to resist monotony. Individuals having a large burden of CO experience difficulty in performing physical work. The maximum aerobic power (VO2max) of young subjects was apparently not impaired when breathing ambient air containing 50 to 75 ppm, but significant reductions can occur if higher levels are present. Carbon monoxide inhalation reduced no further decrease in VO2max of young men at 35 C. Older subjects had a decrease of 2.6% in their VO2max compared to the younger men when breathing 50 ppm CO. Heart rates are compared for young subjects working for 4 hr at either 25 or 35 C breathing either filtered air or air containing 50 ppm CO. The additional load of a decreased myocardial oxygen supply resulting from the presence of carboxyhemoglobin to an already compromised myocardium may provide the impetus for at least an intensification of symptoms. When COHb levels are approximately 5%, resting coronary blood flow must increase some 20% in order to prevent myocardial ischemia. Variation on mode of administration and quantities of CO preclude developing a clear concept of the effects of CO on the cardiovascular system. Several experiments with dogs are described. Confusion remains about COhb s influence on most cardiovascular parameters.

61827 **APTIC NO. 50736**

Ishinishi, Shin

EPIDEMIOLOGY OF DISEASES OF THE RESPIRATORY SYSTEM RELATED TO AIR POLLUTION. *(Taiki-osen tokyuki shikkan). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), vol. 11:10, 1973.*

The effects of air pollution from 1960-1965 on humans in Japan are discussed. Statistical analysis showed that in a respresentative industrial city (Yawata) the average morbidity of respiratory system diseases, rhinolaryngeal diseases, eye diseases, and cancer was larger than in a respresentative mercantile city (Fukuoka) and in a representative rural city (Amaki). Cigarette smoking was the greatest factor affecting lung cancer. Occupational health was the second most important factor, and air pollution was the third. Synergism and age as factors are mentioned.

61828 **APTIC NO. 81948**

Klimkova-Deutschova, E., D. Jandova, Z. Salcmanova, K. Schwarzova, O. Titman, and J. Levy

INFLUENCE OF CHRONIC CARBON MONOXIDE ON THE NERVOUS SYSTEM. *(K otazce chronickehc vlivu kyslicniku uhelnateho na nervovy system). Text in Czech. Cesk. Neurol. Neurochir., 36(1:)1-12, Jan. 1973. 36 refs.*

The existence of chronic carbon monoxide poisoning was critically studied. Experimental data suggest that clinical findings correlate more with CO concentration in the air than with thhe carboxyhemoglobin level. This discrepancy is due to varying intervals of examination after the acute intoxication and to individual tolerance. Subjects with occupational exposure to carbon monoxide were divided into 6 groups. Group A, consisting of 67, gave a history of acute carbon monoxide poisoning; the rest were divided according to exposure time to small doses acting chronically. Clinical signs and symptoms were evaluated according to 112 parameters, and electroencephalogram (EEG) recordings were evaluated in 93 cases. The clinical picture correlated with the carboxyhemoglobin level in 59. The whole group was compared with 52 controls examined for preventive reasons before taking up work in the exposed shops. The results were analyzed by computer. There was no qualitative difference between the persons who had suffered from acute poisoning and those exposed to chronic poisoning only, the difference being merely quantitative. The incidence of headache, fatigue, dizziness, nausea, and emotion change was, however, significantly increased in the group affected by acute poisoning. Dominant features were anorexxia, disturbance of sleep, extrapyramidal lesions, and pyramidal and peripheral paresis in those with chronic intoxication only. Neurological and EEG examination is valuable in the assessment of the state of health in subjects exposed to chronic carbon monoxide poisoning.

61829 **APTIC NO. 81952**

Kosmider, Stanislaw and Adam Misiewicz

ACTIVITY OF PHOSPHATASES IN CHRONIC EXPOSURE TO NITROGEN OXIDES. *(Aktywnosc fosfataz w przewleklej ekspozycji na tlenki azotu). Text in Polish. Przeglad Lekar., 30(5):434-437, 1973. 19 refs.*

An increase in the activity of acid and alkaline phosphatases was demonstrated in subjects chronically exposed to nitrogen oxides in connection with their occupation. Also in experimental studies an increase in activity of the two enzymes was observed both in blood serum and in tissues. These changes are probably connected with disturbances of liver function under the influence of nitrogen oxides. The determination of acid and alkaline phosphatase activities in blood serum of subjects chronically exposed to nitrogen oxides may have some diagnostic value. (Author abstract)

61830 **APTIC NO. 84122**

Lawther, P. J.

RECENT AND PRESENT INVESTIGATION OF AIR POLLUTION CAUSED BY MOTOR VEHICLES. *(Nedavny a soucasny vyzkum znecisteni zpusobeneho motorovymi vozidly). Text in Czech. Cesk. Hyg., 18(8):345-349, Sept. 1973. 10 refs.*

Air pollution in garages and streets caused by polycylic hydrocarbons from the exhaust fumes of gasoline and diesel engines is discussed. The concentration of carboxyhemoglobin in the blood of occupationally exposed persons was studied. Lead concentrations and nitrogen oxides and carbon monoxide was measured in the blood of these persons and in the air. It was found that the level of carboxyhemoglobin was much higher in smokers then nonsmokers. The greatest concentration of carboxyhemoglobin in a nonsmoking traffic warden was 3.8%, while in heavy smokers amounts of 10%, were quite common (the highest was 16.4% in one smoking patient). Exposure to carbon monoxide and smoking does not need to add up if surrounding concentrations are lower, because CO can be released from the blood. The influence of blood saturation by carboxyhemoglobin on the threshold of critical frequency of flicker fusion and the threshold of critical frequency of auditory stimuli fusion did not reveal any significant differences in a comparison with a control group.

61831 **APTIC NO. 79743**

Lenggenhager, K.

LATEST FINDINGS ON THE MODE OF ACTION OF POISONING WITH CARBON MONOXIDE IN HUMANS AND ON THE OXYGEN-BINDING CAPACITY OF HUMAN ERYTHROCYTES. NEW EARLY CLINICAL SYMPTOMS OF CO POISONING. *(Neues ueber die Wirkungsweise der menschlichen Kohlenmonoxidvergiftung und ueber die Sauerstoff-Bindungsfaehigkeit menschlicher Erythrozyten). Text in German. Acta Med. Scand.., Suppl., no. 563:1-45, 1973 (?). 82 refs.*

Studies on the mode of action of poisoning with carbon monoxide in humans and on the oxygen binding capacity of human erythrocytes are summarized. In a group of 12 normal persons subjected to 25-30% CO-blood-saturation a series of 6-10 deep breaths in very rapid succession is regularly followed by brief unconsciousness. The onset of hyperventilation coma occurs earlier at high altitudes than at sea level in the presence of constant levels of CO-blood saturation. This is attributed to a specific effect of alcalosis upon the brain. Hyperventilation coma in slightly CO-intoxicated persons results from reduction of the amount and tension of oxygen in CO-blood; reduction of tension of O2 due to alcalosis; and elevation of the minimal O2-tension threshold necessary for the state of consciousness, owing to a detrimental effect of alcolosis. Animal experiments show that CO mainly affects the breathing center, rather than the heart.

61832 **APTIC NO. 67162**

Lippmann, Morton, Roy E. Albert, William M. Foster, Harold T. Peterson, Jr., Jack M. Berger, and Daryl E. Bohning

THE CLEARANCE OF INSOLUBLE PARTICLES FROM THE BRONCHIAL TREE. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus- Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 100-112. 46 refs. (Oct. 17-18.)*

The clearance of insoluble particles which deposit on the tracheobronchial trees is discussed. The normal duration of the bronchial clearance phase is a characteristic of each individual and can be anywhere from less than 3 hr to almost 24 hr in a given individual. The duration of clearance is relatively constant over a wide range of particle sizes. The amount of clearance depends on the distribution of the deposition between ciliated and unciliated regions. Cigarettes have a variety of acute and chronic effects on bronchial clearance. A tentative schema for the pathogenesis of obstructive lung disease resulting from cigarette smoke or other inhaled aerosols was developed. The initial response to smoke exposure is an acceleration of mucociliary clearance due to increased mucus production. With continued exposure, the ciliastatic effect of the smoke, and/or the production of an excessive thickness of mucus leads to intermittent or impaired mucous transport, and eventually to the accumulation in and blockage of small airways by viscous mucus.

61833 **APTIC NO. 67164**

Maertens, A. and W. Jacobi

IN VIVO DETERMINATION OF THE AEROSOL DEPOSITION IN THE RESPIRATORY TRACT IN ORAL AND NASAL RESPIRATION. *(Die in-vivo-Bestimmung der Aerosolteilchendeposition im Atemtrakt bei Mund- bzw. Nasenatmung). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 117-121. (Oct. 17-18.)*

In vivo determination of the aerosol deposition in the respiratory tract in oral and nasal respiration is described. Water-soluble monodispersed latex spheres were used as aerosol whose concentration was measured by the laser diffraction method in front of the nasal or oral cavity during expiration. In oral respiration, the peremability, i.e., the probability of the expiration of an aerosol particle that penetrated into the lung, was influenced slightly by the aerosol particle size in a range of 0.3-1 micron and at respiratory volumes not larger than 0.4 liter. At slightly increased respiratory volumes, the maximum of permeability was found in a particle diameter range of 0.5-0.7 micron, and the permeability dropped sharply for a particle diameter of 1.95 microns at respiratory volumes over 0.3 liter. In nasal respiration, the permeability dropped sharply in the first 50 cu m of the exhaled air, especially for large particles, which is due to the inertial separation in the nasal region. The minimum of the aerosol separation was 20% for oral respiration, and 30% for nasal respiration. Some 30-50% of all particles are separated in the nasal cavity in nasal respiration in a diameter range of 0.3-2 microns.

61834 **APTIC NO. 81842**

McDevitt, Thomas J.

ALLERGIC EVALUATION OF INDUSTRIAL EMISSION. *Trans. Am. Acad. Ophthalmol. Otolaryngol., vol. 1973:18-21, Jan.-Feb. 1973. 8 refs. (Presented at the American Academy of Ophthalmology and Otolaryngology, Annual Meeting, 77th, Dallas, Tex., Sept. 24-28, 1972.)*

Allergic reactions (coughing and sneezing) experienced by an unusually large number of residents living in an area exposed to dust emissions from several large industrial sources were investigated. Tests with reactive and nonreactive volunteers confirmed the allergic nature of the industrial dust and explained why house-dust-sensitive patients who were usually relatively well during the non-winter months were experiencing allergic symptoms all year round.

61835 **APTIC NO. 50061**

Nieding, G. von, H. Krekeler, and R. Fuchs

STUDIES OF THE ACUTE EFFECTS OF NO2 ON LUNG FUNCTION: INFLUENCE ON DIFFUSION, PERFUSION AND VENTILATION IN THE LUNGS. *Int. Arch. Arbeitsmed., vol. 31:61-72 1973. 26 refs.*

The acute influence of nitrogen dioxide in maximum allowable concentration values on the pulmonary function was studied in 55 healthy male subjects (18-65 years old) and 84 male patients suffering from chronic bronchitis (30-72 years old). Lung perfusion before and after inhalation of NO2 concentrations between 30 and 50 ppm was determined by scintigraphy in rabbits. An inhalation of 5 ppm NO2 over 15 min led to a significant decrease of the carbon monoxide diffusion capacity in the humans. Chronic bronchitis patients exposed to 5 ppm NO2 for 60 showed no more disturbance of the respiratory gas exchange for oxygen than that observed after a 15-minute exposure. A relationship between the inhaled NO2 concentration and increased airway resistance was obvious for concentrations up to 5 ppm; no effect was found in concentrations less than 1.5 ppm. No correlation was found between the increase of resistance after the inhalation of NO2 as dependent upon the initial value of airway resistance. In rabbit lungs, 30 ppm of NO2 inhaled for 15 min resulted in a re-distribution of perfusion showing a reduced storage of activity in the peripheral areas of the lungs. These findings are discussed with a view to a causative association between air pollution, smoking, chronic bronchitis, and pulmonary emphysema. (Author summary modified)

61836 **APTIC NO. 76206**

Pankow, D. and W. Ponsold

MICROANALYSIS OF SERUM CARBON MONOXIDE USING ULTRAVIOLET ABSORPTION MEASUREMENT OF PALLADIUM-2-CHLORIDE. *(Zur Mikroanalyse von Kohlenmonoxid im Blut durch Ultraviolettabsorptionsmessung von Palladium-II-chlorid). Text in German. Z. Med. Labortech., no. 14:360-362, 1973. 2 refs.*

A micromethod for the determination of serum carbon monoxide by direct ultraviolet spectrophotometry of palladium-II-chloride is described. After the reduction pf PdCl2 by CO, the extinction of the excess amount of PdCl2 is measured in 0.01 M hydrochloric acid at 236 nanometers against 0.01 M HCl. The Lambert-Beer law is satisfied within the toxicologically relevant CO concentration range. The direct UV absorption measurement is simpler than the method using chrysoidine for the determination of excess PdCl2.

61837 **APTIC NO. 81502**

Prokop eva, A. S., G. G. Yushkov, and I. O. Ubasheev

MATERIALS ON THE TOXICOLOGICAL CHARACTERISTICS OF THE ONE-TIME EFFECT OF AMMONIA ON ANIMALS DURING BRIEF EXPOSURES. *(Materialy k toksikologicheskoy kharakteristike odnokratnogo vozdeystviya ammiaka na organizm zhivotnykh pri kraftkovremennykh ekspozitsiyakh). Gigiena Truda i Prof. Zabolevaniya, no. 6:56-57, 1973. 5 refs. Translated from Russian, 5p.*

White rats were exposed to various concentrations of ammonia via skin and inhalation routes over periods ranging from 5-60 min. The inhalation of ammonia concentrations ranging from 1-6 mg/l resulted in labored breathing, irritation of the eyes and respiratory tract, cyanosis of the extremities, increased irritability, and the appearance of spasms which were sometimes accompanied by death. Median lethal concentrations were 18.62 mg/l for 5-minute exposures, 12.12 mg/l for 15-minute exposures, 7.04 mg/l for 3-minute exposures, and 7.87 mg/l for 60-minute exposures. Ammonia concentrations between 0.3 and 3 mg/l resulted in a decrease in static muscular stress, leucocytosis, lengthening of the latent reflex period, an increase in the amount of oxygen required, an increase in the blood serum total albumin and sugar, and a decrease in the regenerative capability of the blood serum. Inflammation of the lungs similar to bronchial pneumonia was characteristic of intoxication caused by the inhalation of lethal concentrations.

61838 **APTIC NO. 79894**

Przybylowski, Jan, Wojciech Matuszewski, and Kazimierz Kaminski

CHRONIC TOXIC ACTION OF LEADED 78 GASOLINE VAPORS. IV. MONOAMINE OXIDASE (MAO) AND LACTIC DEHYDROGENASE (LDH) ACTIVITY IN BLOOD AND TISSUES. *(Badania doswiadczalne przewleklego toksycznego dzialania par etyliny 78. IV. Aktywnosc monoaminooksydazy (MAO) and dehydrogenazy kwasu mlekowego (LDH) we krwi i tkankach). Text in Polish. Biul. Sluzby Sanit.-Epidemiol. Wojewodztwa Katowickiego, 17(1):67-70, Jan.-March 1973. 9 refs.*

A total of 40 rabbits were exposed to leaded gasoline 78 vapor having average density of 60 mg/l. A 2-month exposure period (group I) was followed by 6 wk of reconvalescence (group II) and another 2-month exposure period (group III). After 2 mo of exposure the blood serum exhibited an insignificant decrease in MAO (monoamine oxidase) activity was also retained after the 6-week pause. A renewed 2-month exposure resulted in a significant drop in MAO activity. Examinations of homogeneous tissues revealed a significant increase of MAO activity in the brains of groups I and no significant changes after 6-week pause. Group II showed an insignificant increase in MAO activity in tissues of liver. The lung tissue of group I also showed an insignificant increase in MAO activity. The 6-week pause resulted in a significant decrease in MAO activity in comparison to that of group I. An insignificant increase in the MAO activity was observed in the heart tissues of group I and was retained by group II. The LDH (lactic dehydrogenase) activity of blood serum and of separate organs did not show any significant changes and did not require statistical processing.

61839 **APTIC NO. 79893**

Przybylowski, Jan, Wladyslaw Pierzchala, and Malgorzata Panasiewicz

CHRONIC TOXIC ACTIONS OF LEADED GASOLINE 78 VAPORS. III. BLOOD AND BLOOD PLATELET MORPHOLOGY, LEUKOCYTE ALKALINE PHOSPHATASE ACTIVITY, AND SERUM ELECTROLYTIC LEVELS. *(Badanie doswiadczalne przewleklego toksycznego dzialania par etyliny 78. III. Zachowanie sie obrazu morfologicznego krwi, plytek krwi, aktywnosci fosfotazy zasadowej leukocytow oraz poziomu elektrolitow w surowicy krwi). Text in Polish. Biul. Sluzby Sanit. Epidemiol. Wojewodztwa Katowickiego, 17(1):61-66, Jan.-March 1973. 6 refs.*

A group of 40 rabbits was exposed to leaded gasoline 78 vapor of average concentration of 60 mg/l. Morphological blood tests were conducted after 1 and 2 mo of exposure, 6 wk of pause, and 2 mo of renewed exposure. The amounts of red blood cells and hemoglobin increase to their initial levels after exposure is ended. An insignificant lymphopeania was observed 1 mo after exposure, disappeared during the reconvalescence, and appeared again during renewed exposure. The number of blood platelets decreased progressively during the test. No changes were observed in levels of sodium, potassium, or magnesium in the blood serum. It was also established that poisoning by leaded gasoline 78 vapor results in an increased leukocyte alkaline phosphatase activity.

61840 **APTIC NO. 79074**

Rosen, Peter, Phillip Gordon, Angela Savino, and Myron Melamed

FERRUGINOUS BODIES IN BENIGN FIBROUS PLEURAL PLAQUES. *Am. J. Clin. Pathol., 60(5):608-612, Nov. 1973. 29 refs.*

Some pathologic and epidemiologic evidence suggests that benign fibrous plaques may form in the pleura as a reaction to inspired asbestos. Small numbers of typical ferruginous bodies formed in reaction to asbestos and other respirable fibers were identified by means of a tissue digestion technique and microfiltration in three of the eight specimens studied. Another type of iron-coated structure was also found, and designated an atypical ferruginous body. These may be endogenous or exogenous in origin. Ferruginous bodies probably are of little significance in the genesis of fibrous pleural plaques. (Author abstract)

61841 **APTIC NO. 51336**

Sato, Akio, Sachiko Fujiwara, Tamiji Nakashima, and Hirosawa

THE KINETICS OF ORGANIC SOLVENTS. *(Yuki yozai no dorikigaku). Text in Japanese. Preprint, Japan Society of Industrial Hygiene, p. 402-403, 1973. (Presented at the Japan Society of Industrial Hygiene, Annual Meeting, 46th, April 1973, Paper 519.)*

As part of a study of toxicity, themethod of obtaining the rate constant of the absorption, metabolism, and excretion of organic solvents is mathematically explained. When the living body absorbs solvent, the concentration curve plotted by measuring the solvent in the blood forms approximately the same curve. Using a mathematical model of three chambers, the moment the inhalation is completed, the solvent gas in the alveoli (I) is exhaled, and the air without solvent flows in. Therefore, the solvent concentration in the lung (I) drastically decreases. Then the solvent concentration in the body system (II) moves into the lungs, and the concentration in I and II balances. As the solvent in I and II decreases, the solvent in the fat system (III) moves in, and the concentration in all three areas is balanced. Experiments with inhalation of benzene, toluene, and trichloroethylene were made on five young men. The rate constant for the solvent absorption and excretion depended very much on the lipid system of individual bodies. The smaller the rate, the greater is the residue of solvent in the body. The rate constant of benzene was 0.190, toluene 0.203, and trichlorethylene was 0.201. The rate constant of benzene of females are said to be more easily poisoned by organic solvents than males. However, there is no clear sexual difference in the metabolism rate. Urine metabolism is also mathmetically analyzed.

61842 **APTIC NO. 80217**

Stewart, Richard D., Paul E. Newton, Michael J. Hosko, and Jack E. Peterson

THE EFFECT OF CARBON MONOXIDE ON TIME PERCEPTION. *Medical College of Wisconsin, Milwaukee, Dept. of Environmental Medicine, Coordinating Research Council, Inc., and Environmental Protection Agency Contract CRC-APRAC, Proj. CAPM-3-68, Rept. CRC-APRAC-CAPM-3-68-3, 350p., Jan. 1973. 14 refs.*

Twenty-seven healthy adult volunteers were exposed to carbon monoxide at concentrations of less than 2, 50, 100, 200, and 500 ppm for up to 4.5 hours to determine the effect of the gas upon time perception. The subjects were studied in three test settings: seated in small groups within the large environmental chamber, seated isolated in a large environmental chamber, and seated in an audiometric booth. The Beard-Wertheim time discrimination test showed no effects from carboxyhemoglobin saturations ranging from 0.4 to 20%. The test setting did not exert a significant effect upon the performance of this test. The ability to estimate 10 and 30 second intervals was not affected by COHb saturations ranging from 0.4 to 20%. Subject interactions did influence the test results in the group setting. The ability to perform the Marquette time estimation test was not affected by COHb saturations ranging from 0.4 to 20%. The ability to perform the test was influenced by the type of stimulus, its duration, and the test setting . (Author abstract modified)

Dept. of Environmental Medicine, Coordinating Research

61843 **APTIC NO. 84483**

Swiecicki Wladyslaw and Michal Jendyk

EFFECT OF HYPOBARIC HYPOXIA AND VIBRATION ON CARBON MONOXIDE POISONING. IV. EFFECT OF HYPOBARIC HYPOXIA, VIBRATION, CARBON MONOXIDE AND VITAMIN B COMPLEX ON LACTIC AND PYRUVIC ACID LEVELS. *(Wplyw Obnizonego Cisnienia Atmosferycznego I Wibracji Na Przebieg Zatruc Tlenkiem Wegla. IV. Wplyw Obnizonego Cisnienia Atmosferycznego, Wibracji, Tlenku Wegla I Witamin Grupy B Na Zmiany Poziomu Kwasu Mlekowego I Pirogronowego). Text in Polish. Acta Polon. Pharm., 30(6):617-623, 1973. 19 refs.*

Lactic and pyruvic acid levels in 100 male Wistar rats, 180-220 g in weight, exposed to the combined effect of vibration, reduced atmospheric pressure (hypobaric hypoxia) and carbon monoxide, were studied. It was also determined whether or not preceding administration of vitamins B1, B2, B6, carboxylase or cytochrome C prevented or lowered the level of changes occurring in blood and muscles. The combination of vibration, lowered atmospheric pressure, and CO increased lactic and pyruvic acid concentration in blood and muscle more than each separate harmful stimulus. The experimentally noxious factors caused organic anoxia, CO blocked hemoglobin activity and hypobaric pressure led to diminished partial O2 pressure in the surrounding atmosphere. The vibration effect resulted in higher oxygen requirements traceable to a higher level of metabolism activity, which might be linked to a stimulation of the adrenergic and hormonal systems. Prior administration of the vitamin B complex, carboxylase or cytochrome C, however, lowered the level of lactic and pyruvic acids because of the particulation of the former in carbohydrate metabolism and their protective action during anoxia. The investigations revealed that vitamin B1, among the preparations administered, prevented most substantially lactic and pyruvic acid shifts in blood and muscles.

61844 **APTIC NO. 80245**

White, S. W. and R. J. McRitchie

NASOPHARYNGEAL REFLEXES: INTEGRATIVE ANALYSIS OF EVOKED RESPIRATORY AND CARDIOVASCULAR EFFECTS. *Australian J. Exp. Biol. Med. Sci., 51(1):17-31, 1973. 28 refs. (Presented at the Circulatory Control Symposium, International Union of Physiological Sciences, Regional Meeting, Sydney, Australia, Aug. 1972.)*

The unanesthetized rabbit was chosen as the model for a systematic study of nasopharyngeal reflexes. Cigarette smoke and ammonia, formaldehyde, and benzene vapors were used as stimuli. That the nasopharynx is the site of origin of the respiratory and cardiovascular disturbance was confirmed in rabbits breathing through a tracheostomy. The response and its significance were examined in some detail. An analysis of possible autonomic effector and sensory afferent pathways was then undertaken and the role of central suprabulbar and bulbospinal regions in the integration of the reflex examined. The response to nasal inhalation of cigarette smoke is compared in rabbit, dog, and man. (Author abstract modified)

61845 **APTIC NO. 50887**

Yagyu, Hiroshi

THE RELATIONSHIP BETWEEN CONSCIOUS SYMPTOMS AT THE TIME OF PHOTOCHEMICAL SMOG AND THE AMOUNT OF POLLUTANTS. *(Kokagaku sumoggu hasseiji ni jikakusho bunrui to taiki osen to no kankei). Text in Japanese. In: A Progress Report on*

Public Nuisance Researches, No. 2: Basic Medical Experiments Concerning Photochemical Smogs. (Kogai kenkyu chukan hokoku, No.2: Kokagaku sumoggu ni kansuru kiso igakuteki jikkenteki kenkyu). Tokyo Metropolitan Government (Japan), Inst. of Hygiene, p. 40-42. March 1973.

An investigation was conducted on the conscious symptoms of photochemical smog victims between June 26 and July 8, 1972 at a suburban junior high school of Tokyo. A total of 19 symptoms were described, and the average number of occurrences ranged from 3 to 27 a day. The most frequent symptom was headache, complained of by 74 pupils, which was more than 10% of the total number. Oxidant concentration during this period fluctuated, but the daily counts of sulfur dioxide, nitrogen oxide, ultraviolet rays, temperature, and humidity did not fluctuate much. The total symptoms were classified into four groups. Group I had symptoms of breathing difficulty and numbness of the limbs, and had a close relationship with the oxidant level. Group II had eye irriation. sore throat, and exhaustion; Group III had an effect on the entire body. Group II and III had relationships with the concentration of sulfur dioxide. Group IV had shivers and other symptoms and seemed to have no relationship with pollutants or weather factors. Group II and III consisted of 50% of the total symptoms, and Group I was 15% of the total.

61846 **APTIC NO. 84473**

Zagmen, Jiri

TOXICITY OF BLASTING SMOKE. *(La toxicite des fumees de tir). Text in French. Explosifs, no. 3:16-20, July-Sept. 1973. 16 refs.*

Intoxication from blasting smoke is usually due to carbon monoxide. In evaluating toxicity, however, there is disagreement over the affinity of carbon monoxide for hemoglobin. Outside factors such as the sun, atmospheric humidity, barometric pressure, and individual sensitivity have a significant influence on intoxication. The sensitivity to carbon monoxide increases greatly if other noxious gases and vapors are present. At about 18% carbon monoxide in the hemoglobin signs of intoxication appear; at about 47%, unconsciousness; and at 60%, death. The effects of nitrous gases are far less clear than those of carbon monoxide because of the diversity of the mixtures of nitrous anhydrides. Blasting primarily releases nitric oxide and nitrogen peroxide. There is little agreement in the evaluation of toxicity of nitric oxide and nitrogen dioxide. Acute intoxication by nitrous gases begins with coughing, nausea, headaches and sometimes vomiting with traces of blood. This is followed by fatigue, cyanosis, unquenchable thirst, unconsciousness, and frequently pulmonary inflammation, cardiac sclerosis, renal disturbances, pronounced anemia, and tuberculosis. In certain cases intoxication occurs without serious damage to the respiratory system, suggesting that when death occurred, it was due to paralysis of the respiratory centers. Intoxication is notably insidious; even if decease occurs within 24 hours, there are instances of deaths up to one month after intoxication and frequently without any serious damage to the respiratory organs or other pathological manifestations. Opinions also differ about evaluations of the smoke produced by blasting. In the United States, the products of the explosion are determined according to the total carbon monoxide and nitrogen anhydride content.

61847 **APTIC NO. 79199**

Zlateva, M. and V. V lcheva

CHANGES IN THE MUCOUS CONTENT OF TRACHEAL AND BRONCHIAL EPITHELIUM OF WHITE RATS, PLACED AT WORKING ENVIRONMENT, FULL OF SULFUR DIOXIDE. *(Promeni v sluz noto s drzhanie na trakhealniya i bronkhialniya yepitel na beli pl khove, postaveni v rabotna sreda bogata na seren dvoukis). Text in Russian. Khig. Zdraveopazvane, 16(5):433-440, 1973. 14 refs.*

Changes in the mucous content of tracheal and bronchial epithelium of white rats exposed for 3 mo in a working environment contaminated with sulfur dioxide at concentrations above the maximum permissible level were studied. Increased numbers of mucous cells and increased mucous cell content were observed, with a predominance of glucoproteins and sulfurated mucopolysaccharides. The observed changes were reversible when the rats were removed from the contaminated environment and were postulated as being compensatory mechanisms to allow for easier expulsion of the toxic substance and for reduced susceptibility to lung inflammation.

61848 **APTIC NO. 76316**

THE DEFENSE MECHANISMS OF THE RESPIRATORY SYSTEM. *(I meccanismi di difesa dell apparato respiratorio). Text in Italian. Policlinico, Sez. Prat., 8(9):373-377, May 1, 1973.*

Respiratory defense mechanisms can be divided into mechanical, chemical, and cytoimmunological reactions. Cough is the main mechanical mechanism followed by pulmonary purification, which occurs either at the bronchial or alveolar level when cough filtration has not removed all particles. In the first case the Gross muco-ciliary escalator comes into play. It consists of bronchial secretions and ciliary movement. Biochemical mechanisms consist mainly of bronchial secretions which are made up of interlaced fibers immersed and loosened in a aqueous medium rich in ions, salts, and proteins derived from the plasma. There are a number of substances, usually proteins, on the fibrils, which largely contribute to the defense mechanism; they include surfactants, lysozymes, lactoferine, alpha-1-antitrypsine, and certain enzymatic substances such as lactodehydrogenase and deoxyribonuclease. With regard to cytoimmunological mechanisms, macrophages envelop antigenic substances, disrupt them into their various antigenic constituents, then transfer the information to immunoglobins. Alveolar macrophages possess a wealth of enzymes and are rich in lysozymes. Specific immunity is another means of defense whereby the infecting agent is directly intercepted; it mainly deals with harmful viral and bacterial agents. Immunoglobin antibodies play a major defensive role along with phagocytosis.

61849 **APTIC NO. 76456**

Organization for Economic Cooperation and Development, Paris (France)

MERCURY AND THE ENVIRONMENT. STUDIES OF MERCURY USE, EMISSION, BIOLOGIAL IMPACT AND CONTROL. *193p., 1974. 197 refs.*

Studies involving the presence of mercury in the environment are reviewed. Specific topics covered include: properties and uses of mercury, environmental transformations of mercury, industrial alternatives to mercury use, methods for the control of mercury use, socio-economic factors affecting mercury use, national legislation dealing with mercury control, te toxic effects of mercury on man and animals, the mechanism of mercury toxicity, epidemiological studies of mercury pollution, international actions relevant to the mercury problem, and the economic and technique aspects of mercury pollution control.

61850 **APTIC NO. 83852**

Div. of Environmental Sanitation, Shimane Prefectural Office

RESULTS OF HEALTH SURVEY ON THE INHABITANTS IN MASUDA CITY IN AN AREA DESIGNATED BY THE ODOR PREVENTING ACT. *(Akushu boshiho shitei chiiku Masuda shi jumin no kenko chosa). Text in Japanese. In: Environmental Pollution in Shimane Prefecture, p. 312-313, 1973.*

A survey was carried out in 1974 on the health effects of the exhaust (mainly hydrogen sulfide) from a spinning factory in Masuda City. Persons examined numbered 102 males and 339 females, with a control group of 93 males and 169 females.

Consciousness of the odor of the exhaust gas was measured. Complaints of respiratory and general ailments were more numerous in the region with stronger odor. Circulatory and psychoneurotic symptoms were also stronger in regions with stronger odor. However, the state of odor did not seem to affect health.

61851 **APTIC NO. 84669**

Bureau of Environmental Protection, Tokyo Metropolitan Office (Japan)

ON THE EFFECTS OF TOKYO SMOG TO HUMAN BODY, SURVEYED BY INQUIRIES. *(Tokyo smog no Jintai eikyo ni tsuite, enquete chosa). Text in Japanese. 15p., 1973.*

A statistical analysis of an 18-item questionnaire concerning subjective symptoms of 860 high school pupils in 3 schools in Suginami Ward during July 12-Sept. 14 is described. Headache, fever with chill, and pain in the throat were most frequent, followed by eye pain, coughing, and sneezing in 2 schools. The time of occurrence, recovery, and duration of the symptoms peaked at 1 pm, 3 pm, and 2 hr, respectively for boys and 1 hr for girls. Coughing was likely to occur as nitrogen monoxide, nitrogen dioxide, oxidant, and floating dust were high and wind velocity was low. Headache was likely to occur when nitrogen oxides, oxidants, and floating dust were high, wind velocity low, and hours of sun higher. Pain in the throat was likely to occur as sulfur oxides, oxidants, and floating dust were lower.

1972

61852 **APTIC NO. 81789**

Astrup, P.

CARBON MONOXIDE IN TOBACCO SMOKE AND ITS INFLUENCE ON THE DEVELOPMENT OF VASCULAR DISEASES. *Rehabilitation, 25(1 and 2): 11-12, 1972.*

The possible influence of carbon monoxide in tobacco smoke on the development of vascular disease in rabbits was investigated. Animals which were continuously exposed to carbon monoxide for 10 wk (15% carboxyhemoglobin for 8 wk, 30% the last 2 wk) exhibited a cholesterol content of the aorta which was 2.5 times higher than control levels. Pathologically, a very pronounced effect on the luminal arterial wall which was indistinguishable from arteriosclerosis was observed. Intermittent exposure to 0.02% carbon monoxide resulted in a considerably higher cholesterol accumulation than that observed after continuous exposure. Moderate carbon monoxide exposure (0.02%) also increased the neonatal mortality and reduced the birth weight of rabbits. A study of 353 pregnant women (176 smokers and 177 nonsmokers) revealed that the average birth weight of babies delivered by smoking mothers was 2999 g, while it was 3235 g in the group of nonsmoking mothers.

61853 **APTIC NO. 43043**

Barltrop, Donald

CHILDREN AND ENVIRONMENTAL LEAD. *Preprint, Zoological Society of London (England), 8p., 1972. 39 refs. (Presented at a Conference on Lead in the Environment, London, England, Jan. 27, 1972.)*

Death and cerebral damage resulting from lead poisoning continue to occur among children. The effect of lead may involve different tissues at different stages of development and affect a particular tissue in different ways according to the maturation of the constituent cells. The exposure of children to lead in the atmosphere or diet may result in different lead retentions than similarly exposed adults. Lead has been shown to traverse the placenta in humans, although the fetal tissues presumably receive only a share of the total lead absorbed by the mother. Since all children pass through a phase of oral exploration involving pica at some stage in their development, this may be relevant to their lead intake during early life. The most important source of lead for children is lead paint in the home. The increasing concern for this source of lead has resulted in the search for simple, non-destructive techniques for determining lead in paint films in situ. One approach has been the application of the portable isotope fluorescence analyzer, which excites a characteristic X-ray from the lead in the surface to which it is applied. In some cases the ingestion of soil can lead to lead poisoning. Evidence suggests that children do not differ from adults in that symptomatic lead poisoning is unlikely at blood lead concentrations below 80 micrograms/100 g and encephalopathy is unlikely at concentrations below 100 micrograms/100 g.

61854 **APTIC NO. 36272**

Bogen, D. C.

STABLE LEAD CONCENTRATIONS IN THE NEW YORK CITY FOODSTUFFS. *In: Health and Safety Laboratory, Fallout Program. Quarterly Summary Report. (September 1, 1971 through December 1, 1971). Atomic Energy Commission, New York, Health and Safety Lab., p. I-45 to I-52, Jan. 1, 1972, 7 refs.*

NTIS: HASL-246

Nineteen food categories which constitute the typical American diet were analyzed for stable lead by atomic absorption spectrophotometry. The analysis covered foods purchased in New York City over three time periods: Fall 1966-Winter 1967, Fall 1968-Winter 1969; and Fall 1970-Winter 1971. The lead results for the three diet samplings are tabulated. The dietary intake of lead obtained from the first survey was about 285 micrograms/day, while the intake from the other two surveys was between 70-80 micrograms/day. The higher values for the first study are suspected because of contamination of reagents used for the wet ashing of food samples. The dietary intake reported for the second and third food samplings is comparable to the estimated lead air intake of 40 micrograms/day for New York. This value is based on an average lead air concentration of 2 micrograms/cu m and a total daily inhalation volume of 20 cu m. Thus, ambient air contamination may contribute as much to the lead intake as food.

61855 **APTIC NO. 47323**

Busey, William M. and Alexis A. Krumm

STUDY OF SYNERGISTIC EFFECTS OF CERTAIN AIRBORNE SYSTEMS IN THE CYNOMOLGUS MONKEY. *Preprint, American Medical Assoc., Chicago, Ill., 16p., 1972. 19 refs. (Presented at the Air Pollution Medical Research Conference, Chicago, Ill., Oct. 2-3, 1972.)*

A brief overall summary is presented of the results of measurements made on cynomolgus monkeys continuously exposed singly and in binary combination to nitrogen dioxide, sulfur dioxide, carbon monoxide, calcium sulfate, and lead chlorobromide. Body weights, pulmonary function tests, oxygen tension, carbon dioxide tension, acidity, erythrocyte osmotic fragility, carboxyhemoglobin, blood lead levels, delta-aminolevulinic acid in the urine, urinary coproporphyrin, and tissues were studied. Methodology is discussed.

61856 **APTIC NO. 79819**

Flaks, A., J. M. Hamilton, D. B. Clayson, and P. Sims

EVALUATION OF THE CARCINOGENIC ACTIVITY OF THE HYDROXYMETHYL DERIVATIVES OF 7,12-DIMETHYLBENZ(A)ANTHRACENE BY AN IN VITRO-IN VIVO TECHNIQUE. *Int. J. Cancer (Munksgaard), 10(3):548-551, Nov. 1972. 18 refs.*

Tests were conducted on 7,12-dimethylbenz(a)anthracene and three of its metabolites for carcinogenic activity by in vitro incubation with murine pulmonary tissue for 2 days followed by implantation of the explants into isologous mice. The 7-hydroxymethyl-12-methylbenz(a)anthracene and the 12-hydroxymethyl-7-methylbenz(a)anthracene were as potently carcinogenic as the parent hydrocarbon but the 7,12-dihydroxymethylbenz(a)anthracene was inactive. These results are discussed in the light of current theories of metabolic activation of the hydrocarbon. (Author abstract)

61857 **APTIC NO. 42393**

Goethert, Manfred

FACTORS AFFECTING THE TISSUE CO CONTENT. *(Einflussfaktoren auf den CO-Gehalt der Gewebe). Text in German. Staub, Reinhaltung Luft, 32(4):143-146, April 1972. 45 refs. (Presented at the VDI (Verein Deutscher Ingenieure) Clean Air Maintenance Committee, Carbon Monoxide Symposium, Duesseldorf, West Germany, Oct. 28-29, 1971.)*

Different factors affecting the tissue carbon monoxide content were investigated. The noxious effects of long-term exposures to low CO concentrations are not merely due to the oxygen deficiency of the tissues, but also to inhibitory effects on tissue enzymes. The quantity of CO contained in tissues as well as in myoglobin and enzymes is dependent on the CO partial pressure. The CO partial pressure in animals exposed to 86-1000 ppm of CO accounted for 42-69% of that in the alveolar air. The CO partial pressure was dependent on the CO concentration in the inhaled air and the affinity of the hemoglobin to CO. The CO partial pressure in tissues is primarily determined by that in the venous blood. The CO partial pressure in man is relatively low due to the very high hemoglobin affinity. Organs with abundant blood supply have high CO content before saturation. The ratio of the CO bound by hemoglobin and by myoglobin increased with reduced intracellular oxygen partial pressure with given oxygen capillary O2 partial pressure. Experiments revealed the possibility of the partial block of a 3 and P-450 cytochromes due to CO, while the proportion of CO bound to the above enzymes is negligible in comparison to that bound to hemoglobin and myoglobin. An exposure to 60-100 ppm of CO and 120 hours resulted in the liver benzopyrene hydroxylase activity to decrease by 10-25%.

61858 **APTIC NO. 41327**

Hartmann, H. F.

CARBON MONOXIDE - OCCURRENCE; CONCENTRATION; EFFECTS ON MAN - A REVIEW. *Clean Air (J. Clean Air Soc. Australia New Zealand), 6(2):2-7, Feb. 1972. 11 refs. (Presented at the Australian Gas Association, Victorian Branch, Nov. 9, 1971.)*

Carbon monoxide is almost exclusively man-made, derived principally from the incomplete combustion of fuels. Incomplete combustion can be due to insufficient air, inadequate mixing of fuel and air, and quenching of combustion in small combustion chambers. New car emission has been reduced by half in recent years. Atmospheric background CO ranges from 0.01 ppm to 1.0 ppm and does not seem to be increasing. Estimates of the life of the gas in the atmosphere range from 0.1 yr to 5 yr. The U. S. Seven City survey of 1964 showed the urban CO yearly mean to be 5-12 ppm, the daily maximum to be 10-27 ppm, and the 5 min maximum to be 30-60 ppm. Transient peak values have been reported at 150 ppm in Rome and 360 ppm in London. Road tunnels reach 500 ppm. All values are traffic dependent. Carbon monoxide is a chemical asphyxiant. While physical asphyxiant gases have no effect until they reach about 30% concentration, CO concentrations of 0.5 to 1% are repidly fatal. The hemoglobin affinity of CO is about 300 times that of oxygen. Some individuals have very low thresholds for CO. The symptoms for CO poisoning are fatigue, headache, and vertigo. Chronic and acute poisoning are mentioned. The CO standard for the State of California is based on 5% inactivation of hemoglobin. The ambient air standards are set at 30 ppm for 8 hr and 120 ppm for 1 hr. The U.S.S.R. has adopted standards of 2.7 ppm for 20 min and 0.9 ppm for 24 hr. Claims of adverse effects on children and the sick have been reported in the U. S. down to 10 ppm.

61859 **APTIC NO. 80250**

Hausknecht, D. F.

APPROXIMATE MORTALITY RISK FROM SO2 AND PARTICULATES. *California Univ., Los Angeles, School of Engineering and Applied Science, Rept. UCLA-ENG-7242, 7p., May 1972. 4 refs.*

A correlation of increases in mortality rates of populations living in polluted areas is made, based on epidemiological data. Particulates are well established as a synergistic agent for enhancing respiratory effects of sulfur dioxide. Eight pollution episodes and the annual average mortality rates attributed to pollution are shown graphically. Episodes have a worse effect on the community than does chronic pollution, because the extra deaths due to episodes occur close to the same time. Insufficient data exist to establish a definitive single line estimate of the correlation. Sulfur dioxide level times the root of exposure time is established as important in assessing mortality risk.

61860 **APTIC NO. 76240**

Hoffmann, Dietrich

BENZO(A)PYRENE IN POLLUTED AIR. *Preventive Medicine, 1(3):450- 451, Aug. 1972. 3 refs.*

The relative degree of exposure to particulates and carcinogens such as benzo(3-4)pyrene is reviewed for cigarette smokers versus nonsmoking urban dwellers. A heavy cigarette smoker (30 cigarettes daily) living in an unpolluted area exposes his lungs to 600-1000 mg of particulate matter and to 600-1200 ng of benzo(3-4)pyrene in comparison to a nonsmoking city dweller who breathes from 0.2-1.6 mg of particulates and from 0.9-100 ng of benzo(3-4)pyrene. Moreover, because of the different modes of inhalation, the cigarette smoker may retain in his lung up to 95% of the smoke particles and benzo(3-4)pyrene; the city dweller retains a smaller portion of these pollutants in his lungs. Another difference between cigarette smoking and the breathing of polluted urban air involves the size of the particles inhaled. All of the particles in cigarette smoke fall within the range of lung damaging particles (0.1-3 micron), whereas only a portion of the particles in polluted air are within the respirable size range.

61861 **APTIC NO. 81311**

Hoffmann, Dietrich

BENZO(A)PYRENE IN POLLUTED AIR. *Preventive Medicine, 1(3):450-451, Aug. 1972. 3 refs.*

Levels of benzo(3-4) pyrene and particulates in cigarette smoke are compared to those encountered in industrialized urban areas. Benzo(3-4)pyrene levels in mainstream cigarette smoke range from 60-120 ng/l as compared to 0.00008-0.0005 ng/l in polluted urban air. Particulate levels in cigarette smoke range from 60-100 mg/l as compared to urban atmospheric values of 20-80 times 10 to the -6 mg/l. Moreover, all particles in cigarette smoke fall within the range of lung damaging particles (0.1-3 micron), whereas only a portion of the particles in polluted air fall within the respirable range. A heavy cigarette smoker (30 cigarettes daily) living in an unpolluted area is estimated to be exposing his lungs to 600-1000 mg of particles and 600-1200 ng of benzo(3-4)pyrene as compared to a city dweller exposed to 0.2-1.6 mg of particulates and 0.9-100 ng of benzo(3-4)pyrene (breathing rate 8-14 l/min).

61862 **APTIC NO. 81525**

Koehler, R.

REBUTTAL: PROBLEMS OF VANADIUM PENTOXIDE INTOXICATION. *(Erwiderungen: Die Problematik der Vanadinpentoxidintoxikation). Deut. Gesundheitsw., vol. 27:815-816, April 27, 1972. 11 refs. Translated from German. Scientific Translation Service, Santa Barbara, Calif., 5p.*

Urine levels of vanadium pentoxide in workers exposed to dust at oil-fired vapor production installations are compared with those reported for similar occupational exposures and are concluded to be unusually, if not unrealistically, high. Urine values of 3700-5900 micrograms of vanadium/l urine are reported for workers before boiler inspection and values of 6200-14,800 micrograms V/l urine are reported for the same workers after boiler inspection. These values appear to be almost two orders of magnitude higher than values in the literature reported for similar occupational exposures.

61863 **APTIC NO. 79895**

Kosmider, Stanislaw, Marian Drozdz, Stanislaw Jozkiewicz, Mieczyslaw Luciak, Kornel Ludyga, Adam Misiewicz, Jan Szygula, Janusz Pasiewicz, and Kasimierz Zajusz

EFFECT OF COMBINATION OF ACID COMPONENTS OF SMOKE AND GASEOUS AMMONIA ON LONG-TERM TOXICITY IN ANIMALS. *(Wplyw wiazania kwasnych komponent spalin gazowym amoniakiem na przewlekla toksycznosc u zwierzat). Text in Polish. Biul. Sluzby Sanit.- Epidemiol. Wojewodztwa Katowickiego, 16(4):365-413, Sept.-Dec. 1972. 41 refs.*

Two groups of 20 guinea pigs each were exposed 8 hr/day for 175 days to either smoke containing 2 mg/N cu m of sulfur dioxide or the same smoke mixed with gaseous ammonia which reacted with all sulfur dioxide and all nitrogen oxides present in the smoke. Weight, blood and urine of animals were monitored every day during the test and analyzed. Pathological and histochemical analysis of 15 different organs was performed after completion of the test. It was established that addition of ammonia to smoke significantly reduces its toxicity by neutralizing sulfur dioxide and nitrogen oxides. Such neutralization slows down changes in respiratory apparatus, normalizes activity of several enzymes, prevents deterioration of ligament tissues, protects the blood circulation system and functions of a number of other organs, improves synthesis of albumen and prevents decrease of natural immunity to various contaminations.

61864 **APTIC NO. 79896**

Kosmider, Stanislaw, Stanislaw Jozkiewicz, Marian Drozdz, Mieczyslaw Luciak, Kornel Ludyga, Adam Misiewicz, Janusz Pasiewicz, Jan Szygula, and Kazimierz Zajusz

REDUCTION OF THE TOXICITY OF NITROGEN OXIDES BY THEIR COMBINATION WITH AMMONIA. *(Zmniejszenie toksycznosci tlenkow azotu przez wiazanie ich amoniakiem). Text in Polish. Biul. Sluzby Sanit.-Epidemiol. Wojewodztwa Katowickiego, 16(1):49-94, Jan.-March 1972. 43 refs.*

Two groups of 30 guinea pigs each were exposed to 1 ppm concentration of nitrogen oxides and to the same concentration neutralized by gaseous ammonia. The exposure was 8 hr/day for a period of 6 mo. Weight, blood, and urine were checked during the test and various histological and histoenzymatic tests of tissues were performed after the test. It was established that a neutralization of nitrogen oxides significantly reduces their toxicity. Specificially, it was found that the following processes are significantly reduced: damage to respiratory organs, perturbations of acidic-alkaline equilibrium, damages to collagen tissues, and perturbation of activity of enzymes which affect ligament tissues. The following degradation processes are significantly slowed down: deterioration of albumen synthesis, deterioration of natural immunity, metabolic disturbances, increase in acid phosphatase, decrease of hemoglobin and red blood cells.

61865 **APTIC NO. 79240**

Kosta, L., V. Zelenko, P. Stegnar, V. Ravnik, M. Dermelji, and A. R. Byrne

FATE AND SIGNIFICANCE OF MERCURY RESIDUES IN AN AGRICULTURAL ECOSYSTEM. *International Atomic Energy Agency, Vienna (Austria), Isot. Tracer Stud. Chem. Residues Food Agric. Environ. Proc., Ispra, Italy, 1972, p. 87-102. 24 refs. (Oct. 30-Nov. 10.)*

Studies of the distribution, uptake, and metabolic transformation of mercury in a mining and processing area that was considered to be a practically closed ecological system were performed. Mercury uptake by most plant species in the area was generally low; however, mercury concentrations as high as 40 ppm (dry weight) were found in spores of certain mushroom species (e.g., Lycoperdon perlatum) along with similar concentrations of zinc, manganese, and copper. A fraction of the mercury appeared to be in the methyl form. Although the study site was a typical source of inorganic mercury, methylation processes in the aquatic environment appeared to occur very rapidly. Considerable methylmercury concentrations were found in trout near the emission site along with high concentrations of inorganic mercury. Methyl to total mercury ratios increased downstream from the emission source. Very high mercury concentrations were found in the thyroid and pituitary glands of deceased persons from the area, with levels ranging from 18,000-41,300 ng/g and 19,000-64,000 ng/g (fresh weight), respectively, for occupationally exposed persons.

61866 **APTIC NO. 41690**

Krasovitskaya, M. L. and L. K. Malyarova

THRESHOLD CONCENTRATIONS OF PARAFFINS IN SHORT-TERM AND LONG-TERM INHALATION. *In: American Institute of Crop Ecology Survey of USSR Air Pollution Literature. A Second Compilation of Technical Reports on the Biological Effects and the Public Health Aspects of Atmospheric Pollutants. M. Y. Nuttonson (ed.), Vol. 11, Silver Spring, Md., American Institute of Crop Ecology, 1972, p. 78-84. Translated from Russian. (Also: Izv. Akad. Med. Nauk SSSR, vol. 11:43-50, 1968.)*

NTIS: PB 209478

The thresholds of olfactory perception and of the effect on the electrical activity of the brain in human subjects were studied for paraffins to establish a basis for a standard maximum allowable concentration. The chronic effect of paraffin hydrocarbons was also studied, using white male rats subjected to continuous exposures to varying concentrations. The lower paraffins, butane and pentane, had an olfactory effect threshold of 305 and 217 mg/cu m, respectively, for the most sensitive persons. The minimum concentrations at which the formation of the electrocortical reflex was possible in the most sensitive persons were 130 mg/cu m for pentane and 280 mg/cu m for butane. The highest single maximum permissible concentrations proposed, therefore, are 100 mg/cu m for pentane and 200 mg/cu m for butane. In the combined action of butane and pentane, an additive effect occurs. Thus when these substances are jointly present in the air, the permissible concentrations are such that when expressed in fractions of maximum permissible concentrations of each, they must not exceed a sum of 1. After prolonged exposure of experimental animals to the action of pentane, the blood pressure decreased, the subordinative chronaxy was distorted, and the adsorptive capacity of the nervous tissue of the brain changed. The changes already occurred at pentane concentrations of 116 mg/cu m. Pentane at concentrations of 25 mg/cu m during chronic continuous exposure did not cause any appreciable shifts in the body of the animals and is proposed as the mean daily maximum permissible concentration.

61867 **APTIC NO. 83657**

Mclean, A. E. M.

DIET AND THE CHEMICAL ENVIRONMENT AS MODIFIERS OF CARCINOGENESIS. *International Agency for Research on Cancer, Lyon (France) and John E. Fogarty International Center of the National Inst. of Health, Host Environ. Interactions Etiol. Cancer Man Proc., Primosten (Yugoslavia), 1972), p. 223-230. 45 refs. (Aug. 27-Sept. 2.)*

Patterns of cancer incidence are mostly determined by environmental rather than genetic factors. The patterns have their origin largely in differing chemical environments. The chemical environment of man includes: air, and inhaled substances, such as smoke and dust; water; food and drink; substances ingested for social or therapeutic purposes, or for pleasure; and substances used in surface applications. The relationship of nutritional adequacy to carcinogenesis is discussed. The physiological mechanisms of microsomal hydroxylation are discussed in terms of the actuation of carcinogen precursors.

61868 **APTIC NO. 47899**

Miyajima, Fusami, Toshio Hosoda, Masae Kobe, Eizo Hiraoka, Yasuo Kawahisa, and Nobukatsu Ishikawa

AN INVESTIGATION ON THE CONDITIONS OF RESPIRATORY SYSTEMS IN SHIOJIRI CITY, NAGANO PREFECTURE, REPORT NO. 1 (1970) AND REPORT NO. 2 (A FOLLOW-UP A YEAR LATER). *(Nagano-ken Shiojiri-shi ni okeru kokyu-ki ni kansuru kenko chosa, daiippo (45-nendo chosa), dainiho (ichinen go tsuiseki). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 19(10):385, Oct. 1972. (Presented at the Japan Society of Public Health, General Meeting, 31st, Sapporo, Japan, Oct. 25-27, 1972.)*

Shiojiri, an agricultural city of 40,000 population, is designated as a polluted city by dust from its many lime and grinding material plants. Examinations were given to 600 people from district A in an industrial neighborhood and 600 from district B, a control area, in Aug. 1970. A follow-up health examination was given to part of these people in Jan. 1972, on BMRC examination, sputum, lung function, CMI, and chest X-rays. Significant differences were noted between groups A and B in the content and the morbidity of respiratory diseases. There were no special findings by X-ray and lung function tests. Chronic sputum discharge rates were 17.0 in A district and 9.8 in B; continuous coughing was 10.9% in A and 6.5% in B; continuous coughing and sputum discharge were 7% in A and 3.7% in B. Further studies will be given on the morbidity of the A group with reference to past sickness records and smoking habits.

61869 **APTIC NO. 67111**

Norpoth, K., G. Manegold, R. Bruecker, and H. P. Amann

INVESTIGATIONS ON THE PROBLEM OF THE RELEASE OF ALKYLATING COMPOUNDS IN THE COURSE OF THE SMOULDERING PROCESS. *(Untersuchungen zur Frage der Emission alkylierender Verbindungen bei Verbrennungsprozessen). Zentralbl. Bakteriol. Hyg. Infektionskr. Abt. Orig. B., vol. 156-341-352, 1972. 14 refs.*

Auto exhaust gases and fumes from the limited aeration smouldering of plastics, paper, and cellulose at temperatures ranging between 300 and 500 C were collected in organic solvents. Chromatographic analyses show eight of the nine plastics materials examined, the exhaust gas, paper, and cellulose produced or contained substances which react in the same manner with nucleophil chromogens as the alkylating compounds. These results are discussed in connection with the possible hazard to health arising from the presence of alkylating carcinogens contained in the air of industrial areas. It is possible to concentrate the compounds detected in order to submit them to biological examination for their carcinogenic activity. These methods and further improvements of the trace analysis of volatile alkylating substances should provide a base for estimating the specific risk of toxicity, inherent in alkylating agents present in the air, to the community. (Author abstract modified)

61870 **APTIC NO. 75921**

Pressel, Gerhard

SHORT-DURATION ILLNESSES DUE TO HUMIDIFIERS IN PRINTING SHOPS. *(Kurzdauernde Gesundheitsstoerungen durch Luftbefeuchter in graphischen Betrieben). J. Occup. Med., no. 2:35, 1972. Translated from German, 2p.*

Occupational disease associated with air humidifiers in printing shops is discussed. Symptoms among employees in such areas include coughing, breathing difficulties, nausea, and fever. Preventative measures to reduce the occurrence of these symptoms include weekly emptying and cleaning of the humidifiers, final disinfection with a 4% formalin solution, and replacement of the styrofoam float by a copper-tin float. Bacteria of the family pseudomonas are consistently found inside of the air humidifiers.

61871 **APTIC NO. 81858**

Siegfried, W. R., P. G. H. Frost, E. P. Redelinghuys, and R. P. Van Der Merwe

LEAD CONCENTRATIONS IN THE BONES OF CITY AND COUNTRY DOVES. *S. African J. Sci. (Johannesburg), 68(9):229-230, Sept.-Oct. 1972. 2 refs.*

The lead content of bones of laughing doves (Streptopelia senegalensis) from urban and rural locations in South Africa was analyzed by means of atomic absorption spectrometry. The bones of the urban doves averaged seven times more lead per unit weight of tissue than did those of the rural counterparts. The mean lead concentration in the bones of urban doves was 84.3 ppm as compared with 13.1 ppm for bones from rural doves. The higher bone lead levels of urban doves appear to reflect a relatively greater degree of atmospheric lead pollution in urban areas, presumably as a result of motor vehicle exhaust.

61872 **APTIC NO. 67135**

Sorber, C. A., S. A. Schaub, and K. J. Guter

PROBLEM DEFINITION STUDY: EVALUATION OF HEALTH AND HYGIENE ASPECTS OF LAND DISPOSAL OF WASTEWATER AT MILITARY INSTALLATIONS. *U. S. Army, Edgewood Arsenal, Md., Medical Environmental Engineering Research Unit, Proj. 3A062110A806, Work Unit 136, Task Area 00, Rept. 73-02, 39p., Aug. 1972. 72 refs.*

NTIS, DDC: AD 752122

An evaluation is presented on possible health and hygiene consequences resulting from the use of treated wastewater for irrigation of land. Land wastewater application may result in human infection because of inhalation of bacteria-laden aerosols resulting from spray irrigation, and, to date, most biological aerosol determinations in wastewater have been from the analysis of aerosols formed at secondary sewage treatment plants. Land application may affect the flora and fauna of the local ecology and may also increase the types and numbers of disease vectors. Heavy metals, pesticides, and trace organics may cause soil toxicity problems. Biologically treated domestic wastewater also contains from 5-30 mg/l of total nitrogen, with the dominant form usually being ammonia or nitrate; the latter ion is the causative agent of methemoglobinemia in children. The removal of nitrate-nitrogen by denitrification, specifically in a groundwater recharge system is not clearly demonstrated and is far from being proven. Many of the detrimental health and hygiene aspects of wastewater land treatment can probably be reduced by proper wastewater pretreatment, including secondary treatment, filtration, and complete disinfection. (Author abstract modified)

61873 **APTIC NO. 84476**

Sterling, T. D. and S. V. Pollack

THE INCIDENCE OF LUNG CANCER IN THE U. S. SINCE 1955 IN RELATION TO THE ETIOLOGY OF THE DISEASE. *Am. J. Public Health, 62(2):152-158, Feb. 1972. 50 refs.*

An analysis is presented of the incidence of lung cancer in the United States since 1955. Data on the number of deaths from all malignancies, and the number of deaths from lung cancer broken down by 10-year age groups, were obtained from vital statistics. Population figures for the same age groups were obtained from census reports. Death rates were studied for the age groups 0 to 4, 5 to 14, 15 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to 64, 65 to 74, and 75 and up. Three measures of lung cancer death rates were calculated. Population data was estimated for years between census years. Lung cancer rates for individuals younger than 25 yr definitely declined after 1955. Rates for ages 25 to 54 apparently have stabilized. Only for ages over 54 does an increase in lung cancer rates appear to exist. The picture among females is similar to that for males except that the death rates are consistently lower. The agreement of findings by each calculation method is impressive. These data suggest the possibility that particulate pollution rather than smoking may be the primary source of lung cancer in the United States.

61874 **APTIC NO. 81807**

Suzuki, Jon B. and Nicholas Grecz

IN VITRO PHAGOCYTIC AND BACTERICIDAL RESPONSE OF ALVEOLAR MACROPHAGES EXPOSED TO A COMMON INDUSTRIAL AIR POLLUTANT. *Dev. Ind. Microbiol., vol. 14:370-375, 1972. 12 refs.*

The effect of carbon monoxide on the phagocytic and bactericidal response of guinea pig alveolar macrophages was investigated. Alveolar macrophage phagocytic response was measured using calcium-labeled spores of Clostridium botulinum 33A as a test organism. Carbon monoxide in air depressed the phagocytic index. Furthermore, when the alveolar macrophages were allowed to engulf spores normally for the first 15 min and were then exposed to 4% CO, phagocyte-induced germination of engulfed spores was blocked. The inhibition of spore germination was due to the action of CO on the essential enzymes in the phagocyte itself since in trypticase broth spores continuously exposed to 4% CO-air (volume/volume) germinated normally. The inhibition of bactericidal alveolar macrophage processes by CO was further established using Staphylococcus aureus 502A which in control alveolar macrophage systems was inactivated to 80% within 60 min. The alveolar macrophage bactericidal system was impaired in the presence of 4% CO. Morever, engulfed cells of Staphylococcus aureus showed some evidence of multiplication within the leukocytes at 0.5-1% CO. The inhibition of phagocytic and bactericidal responses by CO appears to explain the decreased resistance to pulmonary disease among smokers and urban dwellers chronically exposed to industrial air pollution. (Author abstract modified)

61875 **APTIC NO. 50254**

Tabershaw, Irving R. (ed.)

THE TOXICOLOGY OF BERYLLIUM. *Dept. of Health, Education, and Welfare, Washington, D. C., National Inst. for Occupational Safety and Health, PHS Pub. 2173, 54p., 1972. 81 refs.*

The toxicology of beryllium is reviewed with respect to uses and industrial exposure, air sampling and analysis, experimental toxicology, beryllium diseases, recommended environmental limits of exposure, and industrial hygiene and medical controls. The clinical effects of acute beryllium poisoning include skin irritation, nasopharyngitis, damage to the lower respiratory tract, chemical pneumonitis, and pulmonary edema. Chronic beryllium poisoning is characterized by damage to the respiratory tract ranging from cough and shortness of breath to marked chest X-ray changes, cachexia, and respiratory tract infection. The radiological manifestations, complications histopathology, diagnosis, prognosis, and treatment are reviewed. The toxicity potentials of specific beryllium compounds are tabulated, and the mechanism of beryllium poisoning, biochemistry, and studies in experimental toxicology are discussed.

61876 **APTIC NO. 41689**

Takhirov, M. T.

REFLEX EFFECT ON THE HUMAN ORGANISM OF LOW CONCENTRATIONS OF ACETIC ACID AND ACETIC ANHYDRIDE PRESENT SEPARATELY AND TOGETHER IN ATMPOSPHERIC AIR. *In: American Institute of Crop Ecology Survey o USSR Air Pollution Literature. A Second Compilation of Technical Reports on the Biological Effects and the Public Health Aspects of Atmospheric Pollutants. M. Y. Nuttonson (ed.), Vol. 11, Silver Spring, Md., American institute of Crop Ecology, 1972, p. 61-76. Translated from Russian. (Also: Izv. Akad. Med. Nauk SSSR, vol. 11:73-91, 1968.)*

NTIS: PB 209478

In order to determine the highest single maximum permissible concentration of acetic acid and acetic anhydride in the atmosphere, the threshold levels of acetic acid vapors in 30 persons were determined. The threshold of olfactory perception in the most sensitive persons was 0.60 mg/cu m for acetic acid and 0.49 mg/cu m for acetic anhydride. A concentration of 0.48 mg/cu m of acetic acid vapors caused a statistically reliable increase of the light sensitivity in two of three persons. For acetic anhydride, changes in light sensitivity of the eye in two of the subjects were noted at a concentration of 0.36 mg/cu m. The threshold of effect of acetic acid and acetic anhydride vapors on the electrical activity of the brain was also examined. Biocurrents were recorded from the temporal and occipital parts of both cerebral hemispheres of five persons with normal function of the olfactory system and distinct alpha rhythms. The threshold of electrocortical reflex was 0.29 mg/cu m for acetic acid and 0.18 mg/cu m for acetic anhydride. The proposed highest single maximum permissible concentrations are, therefore, 0.2 mg/cu m for acetic acid and 0.1 mg/cu m for acetic anhydride. During the combined action of acetic acid and acetic anhydride vapors, an effect of complete summation occurs. The threshold mixture in electroencephalographic tests consisted of 0.15 mg/cu m acetic acid and 0.087 mg/cu m acetic anhydride with a total concentration index of 0.99. When acetic acid and acetic anhydride vapors are jointly present in atmospheric air, their total concentration expressed in fractions of the adopted maximum permissible concentrations of each of the substances should not exceed 1.3.

61877 **APTIC NO. 40920**

Takizawa, Yukio, Isamu Ogima, Yoshihiro Watanabe, Koji Sato, Setsuo Kuroda, Tatsuo Oshina, Ryuichi Sugai, and Shuji Yamashita

STUDIES ON EFFECTS OF AIR POLLUTION DUE TO FLUORIDES ON HUMAN BODIES IN NEIGHBOURING AREA OF ALUMINIUM MANUFACTURING FACTORY. (II). *(Arumi kojo shuhen ni okeru fukkabutsu niyoru taikiosen no jintai ni oyobosu eikyo ni kansuru kenkyu. (II)). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no.8:53- 64, Jan. 1972.*

The effects of fluorides on human health were investigated. Residents over 40 years old in a polluted area within 1 km from an aluminum factory in Naoetsu City and residents in a control area were examined on the basis of questionnaires concerning subjective symptoms, general physico-chemical examination, and for those who required closer examination, thyroid gland function tests, X-ray examinations of the bones, electrocardiogram, hematological examinations, and enzymatic function tests. The fluorine content in urine was significantly higher at the 0.5% level in the polluted area. The incidence of residents with 1.2 ppm of fluorine in urine tended to be high in the polluted area, but this was not statistically significant. Subjective symptoms, e.g., chronic bronchitis symptoms, exercise limitations and pains of the joints were recognized in the polluted area with high incidence. Closer examination did not determine any significant difference between the polluted and the control areas. Typical symptoms of chronic fluorosis, i.e., osteosclerosis and mottled teeth, were not established. However, proliferation or calcification of the bones was recognized regardless of area, sex, or age, Pulmonary fibrosis was observed in 65% of all subjects, with a higher incidence among residents near the factory. Thyroid gland function, the counts of erythrocytes and white blood cells, hemoglobin amount, and the values of GOT, GPT, and alkaline phosphatase did not establish any difference according to area or age.

61878 **APTIC NO. 48915**

Thorpe, John J.

HUMAN EXPOSURE TO LEAD IN AIR: A REVIEW OF SOME EXPERIMENTAL AND EPIDEMIOLOGICAL STUDIES. *Proc. Am. Petrol. Inst., Div. Refining, vol. 52:123-139, 1972. 7 refs. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 37th New York, May 8-11, 1972.)*

Two studies on the effects of human exposures to particulate lead in the air are reviewed. The lead-air relationship was studied in an urban area to determine if the same relationship applies in an area of many buildings and side streets as did in an open semi-rural area and to determine the air lead level in relation to the blood lead level in the residents of the area. In the urban area, the lead levels in the air to which the entire population was exposed were not homogeneous, differing with respect to traffic density, outdoor-indoor exposure, and seasonal variations. Blood lead levels were higher in areas where air lead levels were higher, but well within the normal range. The relationships of blood lead levels to air conditioning and smoking were also studied. A second study was geared to determine clinical results of the inhalation of certain atmospheric levels of particulate lead. At low levels of continuous exposure to lead particulates (10.9 micrograms/cu m of air), blood levels in rats and monkeys increased to a plateau approximately twice that at baseline, urinary lead excretion increased in the third and fourth months of exposure, and erythrocyte delta-aminolevulinic acid dehydratase levels decreased to about half of the baseline values. Data from both the epidemiological and laboratory experiments are presented. In view of the information contained in the studies reviewed, the EPA decision that lead levels in excess of 2.0 micrograms/cu m endangers the public health is overcautious.

61879 **APTIC NO. 37983**

Ulrich, Charles E., Marilyn P. Haddock, and Yves Alarie

AIRBORNE CHEMICAL IRRITANTS. ROLE OF THE TRIGEMINAL NERVE. *Arch. Environ. Health, 24(1):37-42, Jan. 1972. 17 refs.*

A series of experiments involving direct electrical stimulation and surgical transection of the trigeminal nerve have confirmed other reports relating to the trigeminal nerve s modulating influence over respiratory control. Electrical recordings from the sensory trigeminal nerves provided direct evidence that relates chemical irritationof the nasal mucosa to afferent impulses on the trigeminal nerve, resulting inhibition of respiratory rate. The unit recording technique could provide a quantitative method for evaluating the biological activities of airborne chemical irritants. These experiments were performed on Sprague-Dawley male albino rats. (Author abstract modified)

61880 **APTIC NO. 48924**

Weir, F. W.

EFFECTS OF 120-HOUR SO2 EXPOSURE ON PULMONARY FUNCTION IN MAN. *Proc. Am. Petrol Inst., Div. Refining, vol. 52:122, 1972. (Presented at the American Petroleum Institute, Division of Refining, Midyear Meeting, 37th, New York, May 8-11, 1972.) (Complete text not available.)*

The effects on pulmonary function in humans of uninterrupted prolonged exposure to controlled atmospheres containing sulfur dioxide were studied. Male subjects were exposed for 120 hours to concentrations of 10, 8, 6, 3, 1, and 0.3 ppm of SO2 in dynamic flow environmental chamber. Daily pulmonary compliance, vital capacity, and maximal expiratory flow were evaluated before and after mild exertion. Dose-related effects were established at subjective concentrations of 6 ppm and above. Minimal but significant reversible changes were determined in the measures of small airway obstruction at the 3 ppm level. (Author abstract modified)

61881 **APTIC NO. 40653**

Woitowitz, H.-H.

THE ROLE OF ASBESTOS IN OCCUPATIONAL MEDICINE ECOLOGY. *(Die Bedeutung des Asbests fuer die Arbeitsmedizin und Oekologie). Text in German. Deut. Med. Wochschr., 97(9):346-351, March 3, 1971. 49 refs.*

Studies on the hazards of asbestos are reviewed. The relationship between occupational asbestosis with and without complications and exposure time was determined. Asbestos bodies were detected in the sputum and lung tissues. Proportionality between the inhaled quantity and the lung tissue reactions was determined. The early diagnosis of asbestosis is possible by means of X-ray examinations and investigations of restrictive ventilation troubles. The actual to nominal value ratio of the vital capacity can be regarded as a relevant parameter of the restrictions of the lung function in asbestos-exposed persons. The differences in the decrease of the oxygen partial pressure due to diffusion troubles in exposed and non-exposed persons were not significant. Hypoxia under physical stress was not a relevant symptom of asbestosis. Pleural plaques, mainly of the parietal type, due to asbestos were observed. Ecological aspects of asbestos contamination are reviewed. The use of certain asbestos goods (brake linings, water pipes, and filters), as well as asbestos processing, involve potential dangers to the public. The relationahip between (pleural) mesothelioma and the presence of asbestos was determined. Random necropsies revealed asbestos bodies in the lungs of 20-50% of all adults examined, regardless of occupation.

61882 **APTIC NO. 40846**

Yamaga, Shinro, Kaoru Ohmori, Isao Murakami, Katsunori Ohmura, Masamichi Ichihara, and Osamu Takahashi

EXPERIMENTAL STUDIES ON THE HEALTH EFFECTS OF AUTO EXHAUST GAS IN LOW CONCENTRATIONS. REPORT 3. HEART RATE OF RABBITS UNDER EXPOSURE TO EXHAUST GAS. *(Teinodo jidosha haikigasu no eikyo ni kansuru jikken teki kenkyu. dai 3 ho. Haikigasu bakuroji kato shenpakusu ni tsuite). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 19(2):61-65, Feb. 1972. 27 refs.*

The effect of auto exhaust gases on the heart rate was investigated. A group of rats exposed to 20-30 ppm of carbon monoxide gas during 260-500 days and a control group of rats were exposed to low concentrations of exhaust gases containing 20-30 ppm of CO, and the changes in the number of heart beats were investigated. The number of heart beats increased significantly in experimental groups, with little increase in the control group. When the experimental and control groups were exposed to high concentrations of exhaust gases containing 1000-1500 ppm of CO, the number of heart beats increased in both groups, but attained peak values 15-18 min after exposure in the experimental group and 5-8 min after exposure in the control group. Autonomic nerve function tests determined relatively strong side effects, in the experimental groups as compared with the controls.

61883 **APTIC NO. 80243**

Zamfir, G. H.

AIR POLLUTION AND BRONCHO-PULMONARY CANCER. *(Poluarea aerului si cancerul bronhopulmonar). Revista Med. Chir., no. 2:577-580, 1972. Translated from Roumanian, 6p.*

The relationship between air pollution and the incidence of broncho-pulmonary cancer is discussed, and a cocarcinogenesis theory is postulated. The etiopathogenesis of pulmonary cancer is seen as involving two stages: the first involves the inhalation of a carcinogenic substance like benzo(3-4)pyrene and the second stage involves exposure to some irritant substance like soot which modifies the pulmonary tract epithelium. The latter exposure intensifies the action of the carcinogenic agent.

1971

61884 **APTIC NO. 38537**

Ayer, Howard E.

BYSSINOSIS. *CRC (Critical Rev. Environ. Control), 2(2):207-241, Aug. 1971. 125 refs.*

Byssinosis is a respiratory disease affecting persons working with raw cotton, flax, or soft hemp. Its effects range from a cough and tight feeling in the chest through early bronchitis and asthma to chronic bronchitis, with emphysema. In the advanced stage, the condition is incurable. The environmental agent responsible for byssinosis is not yet known. From material published to date it appears that a trash component of cotton dust -- most likely from the bract of the cotton plant -- is responsible. This material may act upon the lung by causing histamine release which, in turn, results in bronchoconstriction. Particulate community air pollution is of little or no importance as a source of exposure inside most U. S. mills. For control of byssinosis, a respirable dust level at which not more than 5% of exposed workers develop symptoms or have a decrease in forced expiratory volume (1 sec) must replace the present threshold limit value of 1 mg/cu m of total lint and dust. Until such standards are achieved, all machinery in opening, blending, packing, and carding should have maximal enclosure and be provided with local exhaust ventilation. General ventilation of all operations subsequent to carding should be provided, and particles below 15 micron should be measured periodically. Finally, dust control must be combined with medical evaluation.

61885 **APTIC NO. 35486**

Basu, P. K., G. Lusis, and R. Dhurandhar

THE EFFECT OF AIR POLLUTANTS ON THE EYE. II. A STUDY OF THEIR EFFECT ON THE OCULOCARDIAC REFLEX. *Can J. Ophthalmol., vol. 6:136-138, 1971. 6 refs.*

Albino rabbits were subjected to electrocardiographic studies following exposure of their eyes to acrolein drops. Ocular drops of acrolein produced tachycardia in eight rabbits under general anesthesia and bradycardia in eight animals receiving both general and local anesthesia. In eight other animals under both general and local anesthesia, but with the parasympathetic system blocked by atropine, bradycardia was not observed. This study indicates that irritation of the eye by a constituent of smog can produce bradycardia by a reflex mechanisms under certain circumstances.

61886 **APTIC NO. 41325**

Ferin, J.

EMPHYSEMA IN RATS AND CLEARANCE OF DUST PARTICLES. *In: Inhaled Particles. W. H. Walton (ed.), Vol. III, Gresham Press, 1971. p. 283-292. 6 refs.*

The retention of anhydrous titanic oxide particles in rat lungs was used to test the influence of experimental emphysema, induced by papain, on the physiological clearance mechanism. Lung clearance after a single exposure was a function to the initial lung burden. After a multiple exposure, the retention of particles at the 25th day expressed as percent of deposition is similar to that after a single exposure however, the retention at the 8th day is markedly higher. For a sensitive test, one should use more than one determination of retention after the exposure. Papain-treated rats have a decreased clearance of titanic oxide particles from the lungs. It remains to be seen which factor of the papain model interferes with the clearance mechanism, and how it is related to human emphysema.

61887 **APTIC NO. 38250**

Fukuda, Katsuhiro, Hirotsugu Miyake, and Akira Okada

A MATHEMATICAL SIMULATION OF BODY BURDEN WITH INHALED MERCURY VAPOR. *Japan. J. Hyg. (Tokyo), 26(3):285-290, Aug. 1971. y8 refs.*

Kinetic data from rats exposed intermittently to mercury vapor were simulated by a mathematical model assuming first order kinetics. Differential equations were written with four compartments: lungs, brains, kidneys, and the remaining viscera toxicologically affected. Good agreement was observed between the experimental and calculated values when the model was tested assuming a loss of mercury from the lungs by breathing. The rate constants of mercury transfer were estimated. The discrepancy of mercury content between a high concentration-short term exposure and a low concentration-long term exposure was also simulated by a hybrid computer model with satisfactory agreement with the experimental results. These theoretical findings support the previously made speculation that the rate constant for mercury transfer from the lungs to the other viscera might be smaller than that for mercury uptake by the lungs from the inhaled air. (Author summary modified)

61888 **APTIC NO. 43055**

Holtzman, Richard B. and Frank H. Ilcewicz

RENAL EXCRETION RATES OF 137CS, 21OPB, 21OPO AND STABLE LEAD BY NORTHERN CANADIANS. *In: Radiological Physics Division Annual Report. Argonne National Lab., Ill., Center for Human Radiobiology, p. 306-323, 1971. 24 refs.*

Urinary excretion rates of polonium (210), lead (210), stable lead, and cesium (137) were determined for 29 persons with high Cs (137) body burdens who live above the 64th parallel. The arctic region, because of its low population density and consequent low exposure to automobile exhaust and other industrial technology, provides a region in which estimates of the natural levels of stable Pb in the environment may be made as well as the contribution of atmospheric fallout to the observed levels. The Po and radio- and stable-Pb excretion rates 1-30 times and the Cs (137) body burdens and excretion rates 10-1000 times those of nonarctic residents. Consumption of reindeer and caribou meat appears to be primarily responsible for the increased levels of Pb (210), Po (210), and Cs (137), and, to a lesser degree, those of stable lead. The soft tissue levels of Po (210) in this population appear to be higher than expected from the normal radioactive equilibrium with Pb (210). This is thought to be due to a high ratio of Po (210) to Pb (210) in the lichen and reindeer portions of the food chain. Dose rates from the increased levels of the three nuclides in this Canadian population are estimated to be 140% greater than comparable exposure rates to populations in temperate zones. (Author abstract modified)

61889 **APTIC NO. 34555**

Jech, J.

THE RELATIONSHIP OF AIR POLLUTION TO VALUES OF FORCED EXPIRATORY VOLUME IN 10-YEAR CHILDREN. *(Vztah znecisteni ovzdusi k hodnotam rozepsaneho vydechu u desetiletych deti). Text in Czech. Cesk. Hyg. (Prague), 16(4/5):130-134, 1971. 13 refs.*

Forced expiratory volume was measured in 395 boys and 354 girls, ages 10, living in regions with heavily polluted air (Usti, Most, Teplice). Values for FEV (0.5; 0.75; and 1.0) and forced ventilation capacity were lower in the children, at the one to five percent significance level, than in children from control regions (Pisek, Liverac). (Author abstract modified)

61890 **APTIC NO. 35854**

Kandus, J. and Z. Jurica

THE INFLUENCE OF SO2 ON THE INCIDENCE OF LOWER RESPIRATORY WAYS DISEASES. *(Vliv kyslicniku siriciteho na incidenci chorob dolnich cest dychacich). Text in Czech. Cesk Hyg. (Prague), 16(4/5):135-140, 1971. 34 refs.*

The dependence of acute respiratory morbidity rate on the degree of air pollution due to sulfur dioxide in a sample town population throughout one year was investigated and proved highly significant. Acute respiratory morbidity rate was significantly higher not only during the day with increased levels of SO2 concentrations, but lasted for two days following the exposure. No correlation with atmospheric temperature was determined. The top mean concentrations of SO2 were recorded in November and December, well related with morbidity rate.

61891 **APTIC NO. 43034**

Kneip, T. J., Norman Cohen, David H. Goldstein, and Elizabeth A. S. Muchmore

EXPERIMENTAL STUDIES OF LEAD TOXICITY. *Missouri Univ., Columbia, Environmental Health Center and Extension Div., Proc. Missouri Univ. Fifth Annu. Conf. Trace Substances Environ. Health, Columbia, Mo., 1971, p. 349-361. 11 refs. (June 29-July 1.)*

Experiments were performed with both daily intravenous injections of lead chloride and ingestion of leaded paint and lead paint pigments using the juvenile baboon as an experimental anaimal. Approximate steady state blood lead concentrations of 0.9 and 0.08 mg% were obtained after one week of daily IV administration of either 5.0 or 0.5 mg of lead, per day, respectively. The onset of constipation and anorexia was noted after only one week of 5.0 mg injections and convulsions and blindness occurred within 33 days. Approximately 9% of the cumulative 5.0 mg/day dose was excreted by the end of the first month of injections, while 35% of the cumulative 0.5 mg/day does was excreted in the same time period. Absorption from the gastrointestinal tract was calculated to be less than 1% from ingested daily doses of dried leaded paint or basic lead carbonate containing 50 mg of lead. The interrelationship of variations in the blood lead concentration, the clinical symptomatology of toxicity, and the biochemistry of heme formation are defined in response to the controlled exposures to lead. (Author abstract modified)

61892 **APTIC NO. 43028**

Marienfeld, Carl J. and Harley T. Wright

THE GEOGRAPHIC REFERENCE POINT IN NATURAL EXPERIMENTS. *Missouri Univ., Columbia, Environmental Health Center and Extension Div., Proc. Missouri Univ. Fifth Annu. Conf. Trace Substances Environ. Health, Columbia, Mo., 1971, p. 39-48. 6 refs. (June 29 - July 1.)*

A means of locational ascertainment and mapping of health effects correlated with air pollution based upon latitude and longitude using a grid system expressed in meters as X and Y coordinates is presented. The unit is defined as a 100 meter square area based upon the limit of accuracy of 100 meters using the 7.5 minute geological survey maps for surveillance in environmental epidemiologic studies. This system is oriented toward the establishment of baseline levels of the health of species within one or more of these 100 meter units, and the recognition of minimal changes that may occur, or which may relate to the similarly identified trace chemical environment within that described location. The addition of the computer generated and geo-plotted transparent map overlay enables rapid detection of clusters or unusual rates of health changes or of environmental trace element excesses or deficiencies.

61893 **APTIC NO. 39930**

Men shikova, T. A.

HYGIENIC EVALUATION OF DIBUTYL PHTHALATE IN RELATION TO THE USE OF POLYMER FINISHES IN SHIPBOARD LIVING QUARTERS. *WGigienicheskaya otsenka dibutilftalata v svyazi s ispol zovaniem polimernykh materialov dlya otdelki ahilykh pomeschenii na sudakh). HHg. Sanit (English translation from Russian of: Gigiena i Sanit.), 36(3): 349-353, March 1971. 10 refs.*

NTIS: TT 71-50122

Polymer finishes for living quarters on ships are often plasticized with highly volatile dibutyl phthalate (DBP). Therefore, field and laboratory studies were conducted to determine shipboard DEP levels, the amount of DBP liberated from plasticized polymers, and the biological effects of the plasticizer. Treated pavinols released DBP in concentrations up to 4.73 mg/cu m. Concentrations in the living quarters of a 3-year-old ship reached 1.22 mg/cu m. suggesting the possibility of prolonged liberation in ambient air. The olfactory threshold for human subjects was 0.26-1.47 mg/cu m DBP; the threshold for reflex alteration in ocular sensitivity to light was 0.16 mg/cu m. Concentrations of 0.15 and 0.12 mg/cu m in combination with continuous light produced an electrocortical conditioned reflex. Concentrations of 0.25 and 1 mg/cu m had an inhibitory effect on white blood corpuscles in rats. Based on these observations, 0.1 mg/cu m DBP is recommended as the one- time mean diurnal permissible concentration. Concentrations liberated from shipboard materials should not exceed this limit.

61894 **APTIC NO. 67070**

Moodie, T. W.

RELATIONSHIPS BETWEEN LIMITS SET FOR AIR POLLUTION, PERSONNEL TOXICITY AND HAZARDOUS AREA CLASSIFICATION. *Preprint, Instrument Society of America, Pittsburgh, Pa., 7p., 1971. 20 refs. (Presented at the Instrument Society of America, Annual Conference, 26th, Chicago, Ill., Oct. 4-7, 1971, Paper 71-713.)*

Industry has become increasingly concerned about the working environment of its personnel and about its influence on its neighbors. These concerns have taken the form of tighter controls of material that would previously have been allowed to freely escape. More and more money is being spent on ventilation hoods in gas and vapor areas, and dust collection hoods in dusty areas with the associated separation, dilution, distribution, and other recovery systems. By controlling and preventing the escape of combustible materials, the extent of the area is reduced that is the most hazardous and the extent of the area toxic to workers is reduced. In a public area, the pollution and toxic limits are complied with by separation or dilution of the airborne combustible materials. Limits are given for hydrocarbons, carbon monoxide, particles, sulfur oxides, nitrogen oxides, and photochemical oxidants (smog). (Author abstract modified)

61895 **APTIC NO. 43412**

Nagaoka, S.

AIR POLLUTION AND HEALTH. *In: Annual Report of the Tokyo Metropolitan Research Institute for Environmental Protection. Tokyo Metropolitan Environmental Protection Research Inst. (Japan), p. 56-67, 1971. 8 refs.*

Two separate research studies on the public health effects of air pollution were undertaken. The objective of the first survey was to clarify the health effect of atmospheric carbon monoxide by investigating the relationship between the extent of a CO invasion to the human body and working conditions, reaction time, and degree of exhaustion. These surveys were carried out in Nov. and Dec. of 1969 in Suginami and Senju, Japan. The subjects were 259 drivers and 34 non-drivers. All the drivers were males, seven non-drivers were females.

Smoking had the most noticeable influence on the CO concentrations in expired air from the subjects. The influence of various other factors was not recognized clearly. However, the increment of CO concentrations in expired air of drivers, the influence of indoor heating apparatus to CO concentrations in expired air, and their associations with the degree of exhaustion seemed to indicate the effect of atmospheric CO concentrations to some extent. Some factors which showed no distinct correlation with CO concentrations in expired air were operation by drivers on various bus routes, term of working or the distance of driving on both the previous day and the survey date, space between the clutch and floor of the subject s car, and selective reaction time. The second survey studied the incidence of chronic bronchitis of workers in city offices of the San-Tama area, where pollution levels are considerably lower than in the Tokyo area. The results of this survey were compared with a previous survey of the ward office workers of Tokyo. Although no major differences were noted between the two studies as to single-item symptoms, inspection results of lung function, or volume and type of phlegm, showed there was a greater percentage frequency of respiratory organ diseases in Tokyo than in San-Tama, and within Tokyo itself, the frequency was greater in the more highly polluted districts. Sulfur dioxide is the main polluting agent in these areas.

61896 **APTIC NO. 38440**

Richards, R. J., F. S. Wusterman, and K. S. Dodgson

THE DIRECT EFFECTS OF DUST ON LUNG FIBROBLASTS GROWN IN VITRO. *Life Sci., 11(1):1149-1159, 1971. 13 refs.*

A study was made of the variations in the function of lung fibroblasts during growth in vitro following exposure to inert dusts (glass, anthracite and bituminous coals) or biologically active dusts (silica and chrysotile asbestos). Bituminous coal and glass depressed the collagen level of the cell mat and resulted in the release of chondroitin sulfate into the culture medium. Both anthracite and silica dusts increased the release of hyaluronic acid from fibroblasts and were similar in other respects, except that the level of collagen in the cell mat was depressed by anthracite and unaltered by silica. Chrysotile asbestos reduced growth and increased collagen production in the cell mat and slightly stimulated mucopolysaccharide release into the medium. All dusts reduced the level of protein and caused a significant decrease in the tyrosine level of the fibroblast cell sheet. Because of the differential results obtained, the effects produced by dusts are apparently not due only to the nonspecific action of particles on cells.

61897 **APTIC NO. 41606**

Rodriguez-Alarcon y Fernandez, Justino, Lucio Pita Ramundo, and Joachin Fernandez Castro

AIR POLLUTION AND CHILD MORBIDITY IN MADRID. *(Contaminacion atmosferica y morbilidad infantil en Madrid). Text in Spanish. Acta Pediatr. Espan. 29(348):629-648, Dec. 1971. (Presented at the Congreso Internacional de Higiene, 6th, Medicina Preventiva y Social, Madrid, Oct. 1971.)*

Morbidity among children in certain regions of Spain was studied in relation to monthly and diurnal air pollution monitoring findings concerning mainly sulfur dioxide, smoke, and smoke levels in the air during the year of 1970. Maximum rhinopharyngitis incidence occurred in Tetuan during the February, June, November, and December months and was followed by bronchopulmonary diseases during the November and December months. Average SO2 concentrations were highest during the heating period including January and February, decreased in March and minmum figures during July and August to increase suddenly during the last months of the year. The general trend in SO2 levels was indicative for smoke, sulfur trioxide index, mineral and organic pollutants as well. Included are graphs representing the monthly fluctuations in respiratory diseases, allergies, digestive and infectious diseases among children and graphs describing both morbidity and air pollution levles during the same periods. The incidence fluctuations in bronchopulmonary diseases and rhinopharyngeal disorders was, apparently, associated with the variations in atmospheric SO2, and/or smoke levels during the respective periods. No conclusions were drawn, however, in need for further studies in cooperation between the medical and air pollution investigation services.

61898 **APTIC NO. 43591**

Schlesinger, Richard B. and Morton Lippman

PARTICLE DEPOSITION IN CASTS OF THE HUMAN UPPER TRACHEOBRONCHIAL TREE. *Preprint, American Industrial Hygiene Assoc., Detroit, Mich., 40p., 1971. 37 refs. (Presented at the American Industrial Hygiene Conference, Toronto, Ont., May 26, 1971, Paper 2.)*

Particle deposition in the human tracheobronchial tree was studied using hollow Silastic casts extending from the trachea through the segmental bronchi. A tagged, monodisperse test aerosol was drawn at a constant inspiratory flow rate through the casts. Total deposition was low for particles with aerodynamic diameters below 3.5 micron and increased rapidly with increasing diameter between 3.5 and 12.2 micron. Deposition per generation increased with depth down to the segmental bronchi. Most of the impaction occurred at the bifurcations. At the tracheal bifurcation, the greatest particle accumulation was found along the carina. The reported distribution of sites of bronchial carcinoma was related to the distribution of sites of impaction observed in this study. (Author abstract)

61899 **APTIC NO. 35714**

MOONSHINE: THE ROTGUT RACKET. *Licensed Beverage Industries, Inc., New York, 25p., 1971.*

Illegal distilling activities in the United States are discussed. The information and statistics presented were obtained from various field investigations and from Federal, state, and local law enforcement agencies. Pertinent news accounts are also used to illustrate the health, economic, and social problems generated by moonshine. An overall sharp decrease is reported in the number of still seizures and in moonshine production. However, while production on the local level decreased from 531 gallons in 1968 to 478 gallons in 1969, production on the state level increased from 11.8 million gallons to 12.5 million gallons. Due to the poisonous lead salts found in the product, moonshine consumers are subject to sudden death, permanent blindness and paralysis, or chronic lead poisoning. In two southern cities, 90-91% of seized batches of illicit liquor contained lead salts. As noted by a Federal report, mothers who drink moonshine contaminated by the salts can give birth to babies with serious physical defects.

61900 **APTIC NO. 48067**

Deutsches Zentralinstitut fuer Arbeitsmedizin, Berlin (East Germany)

INDUSTRIAL TOXICOLOGY PART I: GENERAL PART. *(Industrietoxikolgie I: Allgemeiner Teil). Text in German. In: Arbeitswissenschaftliche Lehrbriefe. Rept. 14/15/16, p. 3-63, 1971 (?).*

Introduction into general toxicology is given with special regard to industrial poisoning, first aid procedures, and poisoning prevention possibilities. Some highly toxic gases, such as hydrocyanic acid, hydrogen sulfide, or carbon dioxide in high concentrations may be lethal after short exposure, while other gases such as nitrogen oxides or phosgene lead to serious lung damages after a latency time of 2 to 24 hours. Serious, sometimes lethal, damage to the liver, kidney, hemopoietic organs, and nervous system may be caused by the long-term inhalation of solvent vapor concentrations which are harmless in acute exposure. Another group of toxic gases are stored and gradually eliminated by the organism without apparent damage. The effects of the organism of poisons are dependent on such factors as sex, constitutional differences, habituation, illness, climate, and hypersensitivity. The maximum allowable concentrations of acetone, ethanol, methylene chloride, perchloroethylene, hydrochloric acid, sulfur dioxide, and nitrogen dioxide are largely identical with the respective odor thresholds; while the maximum allowable concentrations determined for ethylacetate, amylacetate, carbon disulfide, cresol, phenol, hydrogen sulfide, pyridine, hydrocyanic acid, and ozone are lower than the respective odor threshold values.

1970

61901 **APTIC NO. 20820**

COMMUNITY AIR QUALITY GUIDES: SULFUR COMPOUNDS. *Am. Ind. Hyg. Assoc. J., 31(2):253-260, March-April 1970. 26 refs.*

The major sulfur compounds detected in the atmosphere are sulfur dioxide, sulfur trioxide, sulfuric acid, sulfates, and hydrogen sulfide. The chief effects of SO2 are eye and respiratory tract irritation, and increased pulmonary resistance. At concentrations of 87 mg/cu m for 2.75 hours, SO3 proved fatal to guinea pigs. Hydrogen sulfide is a respiratory and eye irritant at low concentrations, and at high concentrations can cause respiratory paralysis. It is believed that sulfur compounds produce a more severe effect when they are adsorbed on a particle small enough to penetrate the lung. Sulfur oxides and hydrogen sulfide can also damage vegetation. Materials such as metals, paper, leather, textiles, paint, and ceramics are also damaged by sulfur compounds. It is suggested that the sulfur oxide concentration in the air kept as low as possible to prevent damage to vegetation, deterioration of materials, and to avoid the presumed adverse health effects. Methods for sampling sulfur compounds and their physical and chemical properties are also included.

61902 **APTIC NO. 43001**

Amort, H. and H. J. Einbrodt

LUNG ZINC CONTENT IN SILICOTIC MINERS. *(Der Zinkgehalt in den Lungen von Bergarbeitern mit Silikose). Text in German. Int. Arch. Arbeitsmed., vol. 26:351-362, 1970. 19 refs.*

Using the dithizone method, the zinc content of lungs and lymph nodes isolated by foramid from the bodies of coal miners who had died in varying stages of silicosis was determined. In general, the zinc content was measured at 6 mg/100 g in dried lung tissue and 10 mg/100 g in dried lymph node tissue. Zinc content was much higher than that of silicon as silicon dioxide and magnesium oxide. The lymph transport of zinc from the human lung exceeded that of titanium, magnesium, lead, and silica.

61903 **APTIC NO. 83454**

Astrup, Poul

SMOKING AND CORONARY DISEASE (II): VASCULAR DAMAGING EFFECT OF CO AND HYPOXIA. *(Rokning och koronasjukdom (II): Karbeskadigende virkning af CO of hypoxi). Text in Danish. Lakartidningen, 67(3):256-261, Jan. 1970. 20 refs.*

Relationships between smoking, hypoxia, carbon monoxide inhalation and vascular lesions are discussed on the basis of animal tests and a literature review. Cholesterol-fed rabbits were exposed to moderate concentrations of CO for 10 wk or to hypoxia, inhaling a mixture of 10% oxygen with 90% nitrogen, for 8 wks. At the end of the experiments, the cholesterol content of the aorta in CO-exposed animals was 2.5 times that found in cholesterol-fed control animals. Compared to this control, the cholesterol content of the aorta was 3.5 times higher in animals kept under hypoxic conditions. Microscopic and macroscopic investigations revealed no morphological differences in the arteries between CO-exposed and hypoxic animals. Pronounced lipid accumulation in the intima and subintima, endotheloid hypertrophy and proliferation, and a tendency of pronounced focal subintimal edema were found in both groups. Both hypoxia and CO induced vascular lesions resembling spontaneous arteriosclerosis. The findings indicate the probability of increased risk of arteriosclerosis in smokers due to increased COHb levels.

61904 **APTIC NO. 48028**

De Jorge, Francisco Bastos, Luiz Carlos Gagliardi Ferreira, and Charles Peter Tilbery

VANDIUM IN CHARCOT-MARIE MUSCULAR ATROPHY. *(Vanadio no amiotrofia de Charcot-Marie). Rev. Brasil. Med., vol. 27:303-307, June 1970. 40 refs. Transalate from Spanish. 14p.*

Vanadium concentrations were determined in the blood serum of four patients of the same family with Charcot-Marie-Tooth type disease or progressive neuromuscular atrophy; these results were then compared to the findings in four individuals with no nervous or muscular symptoms. Charcot-Marie-Tooth type disease is a form of muscular atrophy due to degeneration of the cells of the posterior columns of the spinal cord and of the peripheral motor nerves. It begins in the muscles supplied by the peroneal nerves, progressing slowly to involve the muscles of the hands and arms. A clinical and laboratory evaluation of the four patients is presented, and the spectrophotometric method used for determining the blood serum vanadium content is described. Values of vanadium were found in proportion to severity of the disease. Recent studies suggest that vanadium inhibits the synthesis of coenzyme A or panthothenic acid and causes the disappearance of thioctic acid when found in toxic concentrations. In these cases, the metal appears to interfere in the metabolism of sulfhydryl substances. The effect of vanadium on cholesterol, phospholipids, triglycerides, copper in the liver, and other enzymes is also reviewed. It is possible in the case of Charcot-Marie-Tooth type disease, that there is a protein containing vanadium which is reduced or absent, resulting in the deposition of vanadium in the structures which are damaged by the disease. Effective agents for treating the toxic action of vanadium are mentioned.

61905 **APTIC NO. 40337**

Doll, Richard

CHAIRMAN S OPENING ADDRESS. *Hum. Environ. Respir. Syst., Proc., London, England, 1970, p. 5-10. 4 refs. (Oct. 20.)*

The complexity of causes involved in respiratory diseases due to environmental factors are discussed. Factors that may affect the respiratory system include infective agents, physical conditions of heat, cold, moisture, and dryness, natural radiation, industrial pollution, smoking, nutrition, air allergens, personal contact, and psychological pressures of modern life. Automobiles exhaust products are the use of asbestos, as well as nickel, chrome ores, mustard gas, arsenic, and coal tar are also linked to respiratory diseases, e.g., bronchial carcinoma. The synergistic effect of environmental factors is considered.

61906 **APTIC NO. 33442**

Koch, Robert B. and J. D. Skogen

IMMOBILIZED ENZYMES. *In: Odor Sensing Cell Ultrastructure by Electron Microscopy. (Final Report). Honeywell Corporate Research Center, Hopkins, Minn., Air Force Office of Scientific Research Contract F44620-68-C-0006, P002, TR-71-0712, p. 45-54, Dec. 1970. 4 refs.*

NTIS, DDC: AD 720893

Using a column of immobilized glucose oxidase in conjunction with a means of automatically measuring oxygen concentration, the glucose in a sample of solution may be determined by merely passing a small aliquot, in buffer, through the column and past the sensor. Stability and washout tests were conducted with a ratio of acrylamide to N,N-methylene-bisacrylamide used as the gel material. A gel was also prepared with immobilized urease and, if tests prove successful, this column technique would be useful for measuring blood urea nitrogen, an important test relating to kidney function.

61907 **APTIC NO. 76461**

Timbrell, V.

THE INHALATION OF FIBRES. *Medical Research Council, Penarth (United Kingdom), Pneumoconiosis Research Unit, Int. Conf. Pneumoconiosis, 3rd, Johannesburg, South Africa, 1969, p. 3-9. 4 refs.*

The influence of the fiber shape on respirability is discussed, with specific reference to the relative respirability of chrysotile and amphibole asbestos. Gravitational settlement and inertial impaction have the effect of limiting the diameters of asbestos fibers that can reach the pulmonary air spaces to less than about 3 micron. Only fibers of smaller diameter can avoid deposition from gravitational settlement and inertial impaction high in the respiratory tract and succeed in penetrating to the pulmonary air spaces. Interception is important only in narrow airways and concentrates long fibers there, especially at bifurcations. The most striking physical difference between the two main types of asbestos fiber is their shape: the amphiboles are straight and the chrysotiles curly. Although fiber curvature might cause only a short reduction in distance penetrated along an airway, it could mean a difference between landing on the ciliary epithelium and a region whose geometrical complexity would make clearance up the respiratory tract difficult. Experiments are reported in which about six times the weights of asbestos estimated to be in the lungs of rats exposed to the two chrysotiles were estimated in the lungs of those exposed to the three amphiboles. Aerodynamic experiments with different types of asbestos are also described. Comparison of fiber numbers is unlikely to be a good measure of the relative mass of chrysotile and amphiboles in the lungs, since chrysotile fibers readily divide into numerous fibrils. Interception can cause a marked difference between the magnitude of retention of amphibole and chrysotile fibers. (Author abstract modified)

61908 **APTIC NO. 46283**

Vernot, Edmund H., William F. MacKenzie, James D. MacEwen, Paul N. Monteleone, Marilyn E. George, Paul M. Chikos, Kenneth C. Back, Anthony A. Thomas, and Charles C. Haun

HEMATOLOGICAL EFFECTS OF LONG-TERM CONTINUOUS ANIMAL EXPOSURE TO CARBON MONOXIDE. *SysteMed Corp., Dayton, Ohio, Proc. Annu. Conf. Environ. Toxicol., 1st, Fairborn, Ohio, 1970, p. 7-22. 17 refs. (Sept. 9-11, Paper 1.) NTIS: AD 727022*

Long-term continuous exposures of dogs and monkeys to carbon monoxide produce a series of measurable changes resulting from the development of normocytic, normochromic polycythemia. The increase in hematological parameters appears to be a linear function of CO concentration from the lowest, 57.5 mg/cu M, to the highest, 575 mg/cu M, tested. Monkeys responded relatively more profoundly than dogs to increases in hematological values. The Haldane M constant applies to the vivo formation of carboxyhemoglobin, and can be calculated using inhalation data. The effect of exposure to high CO concentration on the oxygen dissociation curve appears to be explainable on the basis of Roughton s assumptions alone. The polycythemia developed as a result of chronic exposure to high concentrations of CO did not compensate completely in blood oxygen transport. Under the conditions of this study, arterio-venous difference in oxygen content provided no evidence of tissue hypoxia in equilibrated dogs. The increase in hematocrit in acclimitized dogs and monkeys is matched by an equal increase in total blood volume. The visosity of polycythemic blood can be explained on the basis of hematocrit increases alone. (Author summary modified)

61909 **APTIC NO. 47546**

Waller, R. E.

AIR POLLUTION AND LUNG CANCER. *UNESCO Courier, 1970:30-32, May.*

Although it is now clear that air pollution cannot be a major factor in the development of lung cancer, there is still an urban factor in the mortality statistics in all parts of the world. Commonly, lung cancer death rates in large towns are two to three times those in rural areas, but against this must be set the finding that cigarette smokers as a whole have death rates that are about 20 times those of non-smokers. Thus any differences in smoking habits between town and country are likely to have a large effect on death rates, and the present situation may be a legacy of lower levels of cigarette smoking in rural areas thirty or more years ago. Epidemiological studies which support this finding are cited.

1969

61910 **APTIC NO. 42598**

Omori, K., G. Yamaga, H. Nakamura, and A. Tanizaki

EVALUATION OF REPEATED EXPOSURES TO NITROGEN DIOXIDE. *(NO2 hanpuku bakuro no jikkenteki kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 4(1):124, 1969. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 10th, Tokyo, Japan, Paper 123.)*

The reaction of histamine in lungs and other internal organs to repeated exposure of nitrogen dioxide was examined. Guinea pigs were exposed to 1 ppm and 5 ppm concentrations, and mice were exposed to 1 ppm NO2, for 3 hours a day, 5 days a week for approximately 2 months. At appropriate times, approximately five animals were killed and the histamine quantities in lungs and other systems were examined. Histamine was measured by a fluorescent photometric method. The water content of lungs were measured by drying the tissue for 24 hr at 110 C. The animal s fatigue was measured by free swim in a 25 C temperature water. Among the 5 ppm guinea pigs, some increase of histamine was noted on the 20th day, and among the 1 ppm group, the same was recongized on the 30th day. Histamine in blood increased slightly and gradually among the 1 ppm groups, but there was no change in the 5 ppm group. Among the mice, no change occurred to the water quantity of lungs, but exhaustion and mortality were brought about more quickly by repeated exposures to NO2.

61911 **APTIC NO. 54257**

Wojciechowski, J.

CARBON MONOXIDE--AN INDEX OF ATMOSPHERIC POLLUTION BY BURNT GASES OF MECHANICAL VEHICLES. *(Tlenek wegla--wskaznik zanieczyszczenia atmosfery spalinami pojazdow mechanicnych). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 3(4(12)):8-15, 1969. 16 refs.*

NTIS: TT 7055123/4

Formulae for extablished permissible concentrations of carbon monoxide, as an indicator of pollution levels in the engine emissions of motor vehicles, are described. The basis for determining permissible conecentrations of CO in the atmosphere is the inactivation of hemoglobin. Tables are given which indicate the correlation between the level of atmospheric pollution by CO and the carboxyhemoglobin content of the blood. The maximum permissible concentration of CO should not exceed 30 ppm.

1968

61912 **APTIC NO. 81506**

Antonyuzhenko, V. A.

OCCUPATIONAL VINYL CHLORIDE INTOXICATION. *(O professional noy intoksikatsii vinilkhloridom). Gigiena Truda i Prof. Zabolevaniya, 12(3):50-52, 1968. Translated from Russian, 5p.*

Occupational vinyl chloride intoxication is reviewed, with particular emphasis on chronic exposure. The initial picture of chronic intoxication, which develops after exposure over a period ranging from 4-5 mo to several years, is distinguished by polymorphism, significant variability in the diseases course, and an inclination to vegetative paroxysms with disorders of the vegetative-vascular system and neurotrophic and neuro-endocrine regulation. The process is not persistent and a tendency to remission is detected soon after terminating contact with the toxic agent. Vegetative-sensory polyneuritis develops in the second stage of chronic intoxication against the background of the first stage syndrome. General asthenization increases in the third and last stage of chronic intoxication. Toxic polyneuritis in this stage is characterized not only by vegetative-sensory disorders but also by motor disorders. Only symptoms of the first stage of chronic intoxication appear to be fully reversible.

61913 **APTIC NO. 82274**

Grandjean, E., C. Capitaine, and A. Gilgen

TOXICOLOGICAL EFFECTS OF NO2 INHALATION IN MICE. *(Toxikologische Wirkungen durch Inhalation von NO2 bei der Maus). Text in German. Z. Praeventivmed. (Zurich), 13(3):142-157, May-June 1968. 22 refs.*

Thirty mice breathed a mixture of air and 20, 40, 100, or 200 ppm nitrogen dioxide; their performance on a swimming test was measured. Performance was lowered by 40 ppm and further reduced by swimming with a weight. Mice exposed to NO2 became fatigued more easily than controls. This reduction in physical performance was reversible and no effects were noted 2 wk after exposure. In tests of chronic toxicity, where 10 wk exposure was alternated with 10 wk recovery, LD50 was 120 ppm. Exposure for 6 hr to test acute toxicity revealed LD50 of 140 ppm. A single exposure to 20 ppm NO2 will decrease mortality from exposure to 200 ppm by up to 90%. Histological study of the lungs from 13 mice, examined 4 wk after cessation of exposure, revealed a thickening of the pulmonary septa in 6 mice. (Author abstract)

1967

61914 **APTIC NO. 82344**

Freour, P., P. Coudray, and P. Barrere

BRONCHO-RESPIRATORY SYMPTOMS IN AN URBAN POPULATION. *(Symotomatologie broncho-respiratoire dans une population urbaine). Text in French. Rev. Tuberc. Pneumol. (Paris), 31(8):1139-1152, Dec. 1967. 12 refs.*

A group of 1357 males aged 30 to 70 from a sample of 2000 randomly picked from the 1962 census of Bordeaux were questioned and classed according to incidence of bronchorespiratory symptoms. Some 55.04% (747) had no symptoms; 28.15% had minor bronchitis; and 16.80% exhibited major symptoms: chronic bronchitis, acute and repeated bronchitis, minor chronic bronchitis, or obstructive syndrome. The effects of age, tobacco usage, and residence were investigated. Major symptoms of bronchitis increased progressively and significantly with age. Minor chronic bronchitis also increased slightly with age. Socioeconomic grouping revealed no significant trend, but a distinct correlation was found between different zones and incidence of symptoms. Only 50.53% of the 1136 smokers had no symptoms, while 76.48% of the 221 nonsmokers were symptomless. The smokers had 31.33% minor symptoms compared to 11.31% for nonsmokers, and 18.04% major symptoms as compared to 12.21% for nonsmokers. Age did not enhance the effect of smoking. The incidence of minor bronchitis rose to 33.84% when a total of 50,000 to 2,000,000 cigarettes had been smoked, but this incidence did not increase with further smoking. The incidence of minor bronchitis apparently increased after 10 cigarettes a day. The significant thresholds for major bronchitis were: smoking more than 100,000 cigarettes, smoking more than 15 a day, or smoking for more than 15 yr. Morbidity ranged from 23.34% in the old quarter of town to 12.50% in the residential suburbs; this difference is statistically significant. (Author abstract)

1966

61915 **APTIC NO. 42532**

Blomquist, Edward T.

DISCUSSION: FUTURE AIR QUALITY STANDARDS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 55-56. 1 ref. (Dec. 12-14.)*

Recent evidence shows health effects of air pollution at levels appreciably below 120 ppm/hr, a standard for carbon monoxide established by the State of California. Functional alterations of neurosensory responses have been recorded at levels of 50 ppm/hr. Continuous exposures of laboratory animals to concentrations as low as 2 ppm cause changes in porphyrin metabolism and morphological changes in isolated nerve cells. Values must meet our needs purely from a health and welfare standpoint and should be national goals. A more conservative air quality standard for carbon monoxide is indicated.

61916 **APTIC NO. 42534**

Chapman, John S.

AIR POLLUTION AND OUR HEALTH. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 23-26. (Dec. 12-14.)*

If a biological species survives in an environment, there is a continuous and intricate interchange between that species, all the other varieties of life, and the environment itself. It does not seem possible to say that atmospheric pollution produces chronic bronchitis, emphysema, asthma, or cancer. But there is no doubt that periods of high pollution and prolonged stagnation aggravate the first three conditions and shorten the lives of people with bronchitis and emphysema. Such atmospheric attacks certainly initiate and exacerbate asthmatic attacks. If the condition of the air is such as to annoy and irritate humans, to reduce their performances from the maxima, it is unhealthful.

61917 **APTIC NO. 81510**

Grigorescu, I. and G. Toba

VINYL CHLORIDE. INDUSTRIAL TOXICOLOGIC ASPECTS. *Rev. Chim., 17(18):499-501, 1966. 10 refs. Translated from German, 8p.*

The presence of monochloroacetic acid in the urine of workers in the vinyl chloride processing industry was investigated as an indicator of vinyl chloride exposure. Monochloroacetic acid was established as a metabolic product of vinyl chloride and was present in the urine of workers exposed to vinyl chloride for 2 yr or more. Paper chromatography was used to separate the metabolite from the urine, and the product was detected using an alcohol solution of ninhydrine and copper nitrite (colorimetric procedure). A modification of serum proteins was also observed in persons whose urine showed the presence of monochloroacetic acid. The albumin concentration was lower than normal in most of these cases. The monochloroacetic acid identification test appears to be specific for establishing the degree of exposure to vinyl chloride.

1965

61918 **APTIC NO. 81507**

Filatova, V. S., Y. S. Gronsberg, N. A. Smirnova, Y. A. Stulova, and I. V. Oreshkevich

PROBLEMS OF OCCUPATIONAL HYGIENE AND THE STATE OF HEALTH OF WORKERS EMPLOYED IN MANUFACTURING LATEX POLYVINYL CHLORIDE. *(Voprosy gigiyeny truda i sostoyaniye zdorov ya rabochikh, zanyatykh na proizvedstve lateksnoyo nolivinilkhlorida). Gigiena Truda i Prof Zabolevaniya, 9(8):9-14, Aug. 1965. 5 refs. Translated from Russian, 9p.*

A case study of vinyl chloride pollution and its effects on workers is presented for the latex polyvinyl chloride manufacturing industry. Vinyl chloride concentrations were the highest in working areas involving vinyl chloride polymerization and latex stabilization, with levels exceeding 60 mg/cu m at times. An examination of workers exposed to vinyl chloride revealed slightly pronounced disorders of vegetative-vascular regulation, symptoms of vegetative polyneuritis, and thermoregulatory disorders. Inadequate ventilation and lack of equipment sealing were factors responsible for the excessive exposures to vinyl chloride.

61919 **APTIC NO. 43062**

Wagner, J. C.

THE INDUCTION OF TUMOURS BY THE INTRAPLEURAL INOCULATIONS OF VARIOUS TYPES OF ASBESTOS DUST. *Proc. Quadrennial Intern. Conf. Cancer, 3rd, Perugia, Italy, 1965, p. 589-608. 26 refs. (June 24-29.)*

Six hundred rats were inoculated with a variety of asbestos dusts in an attempt to obtain evidence that a particular type of fiber was implicated in the production of mesothelioma. The dusts used were crocidolite, extracted crocidolite, armosite, chrysotile, and silica. Each animal received 20 mg of dust injected into the pleural cavity. The nature of the growth and its rate of occurrence were noted for mesotheliomas, lymphosarcomas, fibroasenomas, asbestos dust nodules, and silica tumors. In all the animals inoculated with the crocidolite, amosite, and silica, numerous nodules up to 0.5 cm in diameter were found scattered over both pleural surfaces, and on the pericardium, the nodules being most frequent on the right dome of the diaphragm, and on the right chest wall. The nodules consisted of encapsulated asbestos fibers and dust surrounded by granulomata of the foreign body type consisting of macrophages containing the fibers and particles of dust, giant cells, and a few lymphocytes and plasma cells. All types of asbestos produced a high rate of mesotheliomas in the animals exposed to chrysotile and a low rate in those exposed to amosite. Five sarcomas occurred at the injection sites in animals inoculated with crocidolite. Malignant tumors in the silica- inoculated group appeared as gross enlargement of the mediastinum which spread to the diaphragm, thus differing grom the mesotheliomas, where there was diffuse pleural involvement on the side of the inoculation. Hemorrhagic pleural and pericardial effusions were a common finding. Objections to the dosage procedures employed in the experiment are discussed as well as investigations which have been undertaken to meet these objections.

1964

61920 **APTIC NO. 82176**

OPERATION GUARDIANS OF THE PEACE 1963. *(Operation Gardiens de la paix 1963). Text in French. Lab Munic., Prefect. Police, Paris no. 51.581 D/PA Part II:32-50, Nov. 1964. 1 ref.*

Results are given of air sampling at six busy Parisian intersections during 1963. Mean carbon monoxide levels were 2.0 to 13.7 ppm and mean lead levels, 324 to 980 microgram/100 cu m. Levels of 3,4-benzopyrene ranged to 7 microgram/100 cu m. A group of 331 peace officers were tested for carboxyhemoglobin levels after 5 hr work. The nonsmokers as a group showed a slight rise in COHb, when levels before and after exposure are considered; but even after exposure for 7 hr, 77.1% had levels lower than 0.45 ml/100 ml blood. The smokers as a group tended to lower their COHb levels after work: 31.8% registered less than 0.50 ml/100 ml blood before work and 26.6% after, while 24.9% registered more than 1.25 ml COHb/100 ml blood before and only 20.0% after. The results are compared with previous results, both with respect to the effect of monitoring technique on CO measurements and with respect to a comparison of COHb levels in drivers and in the officers. (Author abstract)

1963

61921 **APTIC NO. 49817**

Livshitz, V. M.

HUMAN ERYTHROCYTES, LEUKOCYTES AND BLOOD PLASMA CONTENT OF SEVERAL MICROELEMENTS. *(Soderzhaniye nekotorykh mikroehlementov v ehritrotsitakh, lejkotsitakh i plazme krovi cheloveka). Vopr. Med. Khim., 9(6):610-614, Nov./Dec. 1963. 15 refs. Translated from Russian. 12p.*

The contents of nickel, zinc, zirconium, tin, molybdenum, silver, copper, vanadium, titanium, aluminum, lead, manganese, and iron in whole human blood, erythrocytes, leukocytes, and blood serum were determined by spectrography. The analytical procedures and research results are reviewed. The patterns of microelement distribution in the blood cells were calculated. The leukocytes were more saturated with Ni, Zr, Zn, Ag, Cu, Sn, and Al than the erythrocytes and the plasma. The content of Ti and Mn was equal in both the erythrocytes and the leukocytes.

61922 **APTIC NO. 35704**

Stoefen, Detlev

POLLUTION OF THE ATMOSPHERE WITH LEAD AND ITS EFFECT ON PUBLIC HEALTH. *(Die Verunreinigung der atmosphaerischen Luft mit Blei und ihr Einfluss auf die Gesundheit der Bevoelkerung. Text in German. Zentralbl. Arbeitsmed. Arbeitsschutz (Darmstadt), vol. 13:39-40, Feb. 1963. ABSTRACT*

A storage battery factory in Germany was found to emit 5.7 kg lead into the atmosphere in 24 hours: a tin smeltery, 14.7 kg. The median daily lead concentration 500 to 700 m from the battery factory was four times the maximum permissible level of 0.0007 mg/cu m; 1500 m from the tin smeltery the atmospheric level was six times the maximum permissible level. High concentrations also prevail inside the plants. Persons exposed for long periods of time to a lead-polluted atmosphere manifested a higher than normal incidence of gastrointestinal, cardiovascular, and nervous diseases. Tissue studies on chickens have disclosed that lead is accumulated in the organism. Removal of lead from industrial emissions by electrofilters must therefore be strictly enforced. Cases of lead poisoning of children living in the vicinity of a lead smeltery are reported. In one case 100 microgram/% lead were found in the blood and 520 microgram/% coproporphyrin in the urine.

1960

61923 **APTIC NO. 81524**

Sanotskiy, I. V.

THE TOXICOLOGY OF TITANIUM TETRACHLORIDE. *(K toksikologii chetrekhkhoristogo titana). Prom. Toksikol., 1960:213-219, 1960. Translated from Russian, 8p.*

Mice, rats, and rabbits were exposed to various concentrations of titanium tetrachloride to assess the toxicity of the compound. The median lethal dose for mice was 0.1 mg/l at an absolute humidity of 5-7 mm mercury and 0.4 mg/l at an absolute humidity of 10-17 mm Hg. A reduction in oxygen consumption, an increase in the summation capacity of the central nervous system, and death ensued with symptoms of edema and pulmonary hemorrhages in poisoned animals. Animals that survived after a single inhalation dose were less sensitive to repeated exposure a month after the first exposure. The reduction in TiCl4 toxicity with increased humidity may be due to an increase in the rate of hydrolysis and to a change in the dispersion of the formed aerosol.

1938

61924 **APTIC NO. 49672**

Joetten, K. W. and H. Reploh

EXPERIMENTS ON THOMAS SLAG DUST AND MANGANESE PNEUMONIA. *(Experimentelles zur Thomasschlackenstaubun Manganpneumonie). Proc. Int. Congr. Accidental Med. Occup. Dis., 8th, 1938, p. 1028-1038. 5 refs. Translated from German. Scientific Translation Service, Inc., Santa Barbara, Calif., 12p.*

Manganese pneumonia, a typical occupational disease of individuals working with manganese dioxide, and with the processing, bagging, and loading of Thomas slag or Thomas meal, was investigated. The manganese content of Thomas slag dust (from 6.68 to 7.76%) was taken into consideration in experiments with rabbits to determine the effect of inhaling manganese oxide on lung changes and the development of pneumonia. The experimental procedure is described, and the results of three series of tests and the microscopic findings for each series are presented. The results of these experiments support the similarity found between manganese and Thomas slag dust penumonia determined by other researchers.

EFFECTS-PLANTS AND LIVESTOCK

1976

61925 **APTIC NO. 82063**

Aoyagi, Y. and M. Mizuta

SURVEY OF DISTRICTS USING EPIPHYTIC BRYOPHYTA AS INDICATOR AND THE EXAMINATION OF THE RESULTS. *(Chakusei kokerui o shihyo to shita chiikichosa to sono kento). Text in Japanese. Ichikawa High School, Japan, 51p., 1976. 6 refs.*

Sudden urbanization accompanied by air pollution may affect the growth of trees. A survey of vegetation, especially bryophyta, in Ichikawa City is described in detail. The survey method and indicator plants are described. Maps of 6 species of moss and 9 species of lichen on 27 species of host plant are given. There was a correlation between a map of sulfur dioxide concentrations published by the City Office and the species- specific distribution map of epiphytes.

61926 **APTIC NO. 76198**

Fukuto, T. R.

CHEMISTRY AND MODE OF ACTION OF INSECTICIDES. *California Univ., Riverside, Dept. of Entomology, Environmental Protection Agency Grant R-801837, Program Element 1EA078. Rept. EPA-600/1-76-004, 334p., Jan. 1976. 236 refs.*

Research from January 1, 1971 to September 1, 1975 on intoxication and detoxication processes which occur when animals or plants are exposed to organic insecticides is reviewed. Progress in the following general areas is described: insecticide selectivity, insecticide metabolism, the inhibition of cholinesterase enzymes, structure-activity relationships in insecticides, the oxidation conversion of phosphorothionate esters to phosphate esters, insecticide synergism and insect growth regulators, chemical reactions involving carbamate and organophosphorus esters, insecticide cyclic nucleotide interactions, insecticide penetration and its relation to resistance, the gas chromatographic analysis of insecticides, neurophysiological studies on insecticide mode of action, insecticide resistance, and the joint action of herbicides and insecticides. (Author summary modified)

61927 **APTIC NO. 83082**

Garrec, J. P. and A. M. Lhoste

ELECTRON PROBE MICROANALYSIS OF FLUORINE IN POLLUTED NEEDLE SECTIONS OF ABIES ALBA. *Fluoride, 9(1):63-70, Jan. 1976. 15 refs.*

The effect of hydrogen fluoride fumigation on secretions of needles of Abies alba was investigated by electron probe microanalysis. The levels of fluoride varied in different tissues. Most fluoride was found in the spongy mesophyll and the palisade tissues as a function of the distance from the cells of entry and the paths of translocation of fluoride. The differential responses of various tissues of a leaf to fumigation with HF depended on the localization of the tissues rather than on a specific response by a particular tissue to fluoride. (Author abstract modified)

61928 **APTIC NO. 84092**

Hasebe, T., N. Ichikawa, and K. Takao

VISIBLE DAMAGE OF PLANTS DUE TO SULFUR COMPOUNDS. PRELIMINARY REPORT. *(Aryu san gas sesshoku ni yoru shokubutsu no kashi-shogai ni tsuite). Text in Japanese. Japan. Soc. Soil Sci. Manure Hokkaido Branch Meet., 1974-1975, p. 15, 1976.*

In a gas-contact vinyl greenhouse (volume 83 cu m) in the Central Agriculture Experiment Station in Hokkaido, a preliminary experiment was carried out to identify visible injuries to plants exposed to sulfur dioxide at 0.3 or 0.8 ppm. Smoky spots appeared on leaves sooner as the concentration of the gas was higher; with, however, nearly the same symptoms at 0.3 as at 0.8 ppm. Spots appeared sooner on leaf blades in middle positions. The sensitivity of crops showing smoky spots was in descending order of buckwheat, alfalfa, clover, timothy, maize, beans, paddy rice and sugar beet. The sensitivity of herbs decreased through Oenothera, Taraxacum, Petasites, Artemisia and Reynoutria. The effect of adding sulfur to the soil in which buckwheat and alfalfa were planted was seen in the sulfur content of the plant body, but not on the onset of smoky spots.

61929 **APTIC NO. 84501**

Hashimoto, S., and Y. Ota

ANALYSIS OF AGRICULTURAL CROP DAMAGE DUE TO AIR POLLUTION PART 1. EXAMINATION BY PLANT-DEPOSITING METHOD. *(Taikiosen niyoru nosakubutsu higairyo no kaiseki Part 1 Haichi-ho niyoru kento). Text in Japanese. Japan Crop Science Society, Crop Sci. Jap. Soc. Lect. Meet. 16th, 1976, p. 121-122. (April 2-3.)*

Soya bean plants and maize were planted and grown by hydroponics at 15 selected places each located from Edogawa, Tokyo Metropolis to Kuroiso City, Tochigi Prefecture. The seedlings were transplanted in July, interim surveyed in August, and harvested on Oct. 9. The results of an interim survey revealed that both plants showed local differences of growth becoming smaller, thinner in leaf color, and smaller in leaf size the nearer they were to Edogawa. There was a negative correlation between the oxidant dose from July 10 to August 20 and the amount of plant growth.

61930 **APTIC NO. 84507**

Hatta, H. and K. Terakado

ENVIRONMENTAL DETERMINATION OF PAN AND PLANT DAMAGE. *(PAN no kankyu sokutei to shokubutsu no higai). Text in Japanese. Preprint, General Research Society for Environmental Science, Japan, p. 50-51, 1976. (Presented at the Environmental Science Meeting, 2nd, Tokyo, Japan, June 4, 1976.)*

The variation in concentration (hourly and yearly) of PAN (peroxyacetyl nitrate) and oxidant, and the damage occurrence of petunia were reported. The PAN was determined by ECD-GD; oxidant was determined by the neutral potassium iodide absorbance method; nitrogen oxides by Saltzman s method; sulfur dioxide by electroconductivity, and ozone by automatic chemiluminescence recorder. Petunia plants were planted outdoors. The results since September 1973 are given. The maximum concentration of PAN was 8.4 ppb on May 18, 1974 when oxidant was 27.5 pphm. There was a correlation between the maximum (day) values of PAN and oxidant (1 hr) and another correlation appeared between the doses over 7 pphm of oxidant and over 1 ppb of PAN, the content of PAN in oxidant being 2-6%. Although PAN occurred along with oxidant, the disappearance of PAN did not accompany the disappearance of oxidant. The concentration of PAN and oxidant were both higher in May-June and the end of July-August, and even at low oxidant levels, PAN was higher in February-March and October-November in 1974. Visible damage on plants due to PAN was conspicuous in petunia, especially the White-ensign variety, at a dose of 9 ppb-hr at more than 1 ppb and at a dose of 3 ppb-hr more than 2 ppb. The time and frequency of severe damage of petunia coincided with the time of occurrence of PAN. The fact that petunia was severely damaged by PAN with only 2-6% oxidant suggests the existence of pollutants other than PAN.

61931 **APTIC NO. 84650**

Ishikawa, H.

ON THE RELATION BETWEEN THE BROWNING OF PHYLLOSTACHYS HETEROCYCLA VAR. PUBESCENS AND AIR POLLUTION PART 1. *(Mosochiku no kappen- gensho to taikiosen tono kankei ni tsuite (1)). Text in Japanese. Shokubutsu to Shizen (Plants and Nature), 10(5):28-33, May 1976. 9 refs.*

In order to select indicator plants for fluorine gas in the air, several plants grown in southern mountainous areas were surveyed near the Niihama industrial area, and general browning of the leaves of Phyllostachys heterocycla (variety pubescens) grown in an area 600-800 m from the fluorine factory was observed (the leaves of the same plants showed a light green color when they grew 8 km from the factory). A detailed survey on the same plants grown in 23 places indicated that (1) The newly developed leaves of P.h.p. in all places were bright green in color in July. (2) Browning of the leaves of plants near the factory increased. (3) In April of the next year, almost all the leaves of the plants near the factory showed severe browning, and (4) The degree of browning was more severe as distance from the factory decreased.

61932 **APTIC NO. 84646**

Kawamata, M.

FROM THE EXPERIENCE OF ENLARGED MOVEMENT OF OBSERVING MORNING GLORY S INJURY IN THE SECOND YEAR. *(Hirogari o miseta 2 nenme no asagao kansatsu undo no keiken kara). Text in Japanese. Preprint, General Research Society for Environmental Science, Japan, p. 126-127, 1976. (Presented at the Environmental Science Meeting, 2nd, Tokyo, Japan, June 4, 1976.)*

The program of observation of morning glory by citizens to monitor the occurrence of photochemical smog is in its second year in Tachikawa City. Observation of petunia has now been added to the plan. The potted morning glory (Scarlet O Hara and Cherio varieties) was observed once a week. The petunia varieties White Ensign (highly susceptible) and Blue Ensign (not so susceptible) were observed daily. In the total area of Tachikawa, a high correlation was found between the cumulative values of oxidant (each of which was over 8 pphm-hr/wk) and the weekly number of leaves of morning glory, with some fluctuation in July, possibly due to the local difference of plant growth. Differences in susceptibility to oxidant were observed between Scarlet O Hara and Cherio. Injury of morning glory was noticed almost all over the city, however, the degree of injury tended to be lighter to the west. The injury in the center of the Tokyo Metropolis was the lowest.

61933 **APTIC NO. 82062**

Kitamaura, F.

ROADSIDE TREES AND TREES FOR HEDGES, URBAN ENVIRONMENT AND TREES. *(Gairoju to Ikegakiju, toshikankyo to jumoku). Text in Japanese. Iden (Heredity), 30(2):27-33, Feb. 1976. 22 refs.*

Damage to trees in an urban environment, the value of roadside trees, and the necessary characteristics for species used for roadside planting are discussed. Trees must be able to adapt to environmental pollution, including air pollution. A 1968 survey of roadside species and their numbers in Japanese cities (105 species and 515,287 trees) is discussed. Trees used as hedges are also described.

61934 **APTIC NO. 83643**

Kitamura, F.

STUDIES ON THE RESISTANCE OF GARDEN TREES AND SHRUBS AGAINST SULFUR DIOXIDE PART 1. SEASONAL CHANGES IN THE RESISTANCE OF THESE PLANTS. *(Zoen Jumoku no Aryusangas Teikosei Ni Kansuru Kenkyu Part 1. Aryusan gas Teikosei no Kisetsuteki Heni ni tsuite). Text in Japanese. Zoen Zasshi (J. Jap. Inst. Landscape Archit.), 39(3):29-33, Jan. 1976. 8 refs.*

Seasonal fluctuations in the resistance of garden trees to sulfur dioxide were studied. Potted cuttings of 3-4 year old Chamaecyparis obtusa var. breviramea, Eunonymus japonicus, and Rhododendron indicum were exposed to sulfur dioxide in an exposure chamber at 3 ppm for 3 hr at 20 C during the day in May, July, and Nov., 1972 and Jan. and March 1973, with artificial rain just after exposure for one group. The degree of damage to leaves was taken as the reciprocal of the resistance, and classified into 5 categories. The resistance to sulfur dioxide was highest in Jan., March, and Nov., and lowest in July, followed by Sept. In May, the relative resistance differed by species. The rate of leaf-fall roughly coincided with the degree of visible damage observed. All the damaged trees recovered. Artificial rain after exposure did not remarkably reduce the damage. In general, c.o.b. was highly resistant to sulfur dioxide followed in order by E.j. and R.i.

61935 **APTIC NO. 84651**

Masujima, H.

THE AGGRAVATION FO AGRICULTURAL PRODUCTION AND COUNTERMEASURES. *(Nogyo seisan kankyu no akka to sono taisaku). Text in Japanese. Nogyo to Keizai (Agriculture and Economy), vol. 1976: 37-43, 1976.*

Japan is the country most deeply impacted by environmental pollution as it affects food production in the world. Air pollutants which attack agricultural products include ozone, peroxyacetyl nitrates, nitrogen dioxide, sulfur dioxide, hydrogen fluoride, chlorine, and ethylene. The specific susceptibility to each pollutant of taro, lettuce, tomato, alfalfa, gladiolus, rice, and cattleya is given. The characteristic symptoms are spots on the leaves (white and brown in color), metallic color on the lower surface of the leaves, spots (white to brown in color) in the mesophyll, whitish-yellow from the leaf periphery, bleached spots between leaf veins, and withering of the sepal apex, in that order. Metal-containing dust affects agricultural crops. The importance of invisible damage that occurs before visible damage appears is emphasized. There is no direct countermeasure against the primary pollutant. The countermeasures against secondary pollutants such as photochemical oxidant are now under field study techniques; such as shading, limitation of irrigation, and misting are considered. Damage-reducing agents are under study for use before the occurrence of photochemical smog. Air pollutants affect human health as well as crops.

61936 ***APTIC NO. 82498***

Matsui, T., Y. Nishi, and T. Asai

CLASSIFICATION AND DIAGNOSIS OF AIR POLLUTION BY BIOLOGICAL INDICATORS. PART 1. (Seibutsu shihyo ni yoru taikiosen no bunkyu to shindan (1)). Text in Japanese. Kankyojo Kagaku (Environ. Inf. Sci.), 5(1):52-63, 1976.

Comparative studies of several biological indicators in an area having the Ube coastal industrial zone as the apex were conducted. Epiphytes on evergreen broad leaf trees, substances on leaves and the sulfur content of leaves were investigated. The vigor of common trees such as Machilus thunbergii, costanopsis sp, Myrica rubra, Irex rotunda, Pinus thunbergii and Pinus densiflora was studied. The destruction of forests in the area was investigated. Soil respiration was determined. The state of influorescence of Osmanthus fragrans, a sensitive indicator, was investigated for 3 years.

61937 **APTIC NO. 84548**

Matsui, T., Y. Nishi, and C. Asai

CLASSIFICATION AND SURVEY OF AIR POLLUTION BY BIOLOGICAL INDICATOR PART 2. *(Seibutsu shihyo ni yoru taikiosen no bunkyu to shindan (2)). Text in Japanese. Kankyo Joho Kagaku (Environ. Inf. Sci.), 5(2):61-72, 1976. 20 refs.*

In order to establish a monitoring system for air pollution using biological indicators, 41 points were selected in the hinterlands of Ube and Onoda. Pollution sources were in the coastal industrial zone. A case study was carried out in classification of the degree of air pollution using epiphytic bryophytae, measuring soil respiration, the components of matter adhering to leaves, the sulfur content of leaves, the activity of vegetation, and the flowering of Osmanthus fragrans in the winter of 1973 and summer of 1974. Pollution sources were found to be sulfur dioxide with relatively less fluorine, dusts, and auto exhaust. Epiphytic bryophytae and the activity of vegetation were sharp indicators of the cumulative effects of low concentrations of air pollution. Soil respiration coincided well with these indicators. Sulfur content was found not to be as appropriate an indicator as the adhered matter on leaves, sulfur dioxide, sulfuric acid, and fluorine. The flowering of O.f., although affected by salty wind, seemed to be a fairly effective indicator of air pollution by sulfur dioxide. The status of air pollution in the two cities was found to depend on topological abnormality of wind direction. In these situations, biological indicators were found to be effective in indicating air pollution in lower concentrations for long-term exposure.

61938 **APTIC NO. 84587**

Matsunaka, S.

PROCEDURES OF QUANTIFICATION OF CROP DAMAGE DUE TO AIR POLLUTION AND ITS PROBLEMS. *(Taikiosen ni yoru nosakubutsu higai keiryoka no shuho to mondaiten). Text in Japanese. Nogyo Gijutsu (Agric. Technol.), 31(6):250-255, June 1976. 18 refs.*

The procedures for quantification of crop damage (economical effects) were described for the case where the visible damage directly effects the yield of crop and amount of production, the case where visible damage indirectly effects the yield, and the case of invisible (or hidden) injury. In the first case, the method utilized is the quantification of the indicator plant damage such as is used in the case of plant diseases. In the second case, the method utilized for estimating the probable reduced yield is one which has been developed by statistical investigators on agricultural crops. In the third case, it would be difficult to draw conclusions using a single method. The following procedures should be used in combination: measuring the change of physiological parameters such as photosynthesis, transpiration, enzymatic activity, and specific components within the plant; utilizing the pure environment chamber equipped with weather controlling system; placing plants in spots with similar meteorological conditions but with different degrees of air pollution; utilization of damage-reducing agents; and statistical methods by which past and the present data are arranged to compare with the similarly arranged air pollutant data. The results of a survey on quantification of plant damage in Pennsylvania are described in detail.

61939 **APTIC NO. 83703**

Matsunaka, T.

STUDIES OF UTILIZATION OF INDICATOR ORGANISMS FOR MONITORING OF FORESTRY AND FISHERY ENVIRONMENTAL POLLUTION AND THE LIMIT OF UTILIZING THEM. *(Norinsuisan kankyo ni okeru sono shihyoseibutsu no taiseigenkai to sono riyo). Text in Japanese. Kankocho Kogai Senmon Shiryo (Public Nuisance Gaz.), 11(2):91,92-103, March 1976.*

The resistance of indicator organisms to pollutant gases and methods of managing and using such organisms are described. In a first study, indicator plants were exposed to pollutants such as sulfur dioxide, ozone, nitrogen dioxide, and ethylene. Selection of indicator plants by field planting and field investigation were undertaken. The maximum tolerance of indicator plants (such as that of morning glory to ozone) was found. The mechanism of plant damage due to air pollutants such as ozone and sulfur dioxide was studied. In a second study, methods of management and cultivation of indicator plants, standards for determining environmental pollution using indicator plants, and an experiment demonstrating a monitoring system utilizing indicator plants were developed.

61940 **APTIC NO. 83861**

Matsuoka, Y.

PLANT INJURY DUE TO AIR POLLUTION-SIMILAR SYMPTOMS PART 1. *(Taikiosen ni yoru shoku butsu higai-ruijishojo (1)). Text in Japanese. Nogyo Oyobi Engei (Agr. Hort.), 5(1):1 page, 1976.*

There are many kinds of plant diseases whose visible symptoms are very similar to those caused by air pollution. The similarity of plant damage due to air pollution and to meteorological causes is discussed. Stifle disease (akagare) on rice plants (reddish-brown spots on leaves similar to those caused by oxidant), leaf injury of kidney beans by spider mites (minute white spots similar to those caused by oxidant), and leaf injury of azalea by azalea lace bugs (minute white spots similar to those caused by oxidant) are shown in photographs.

61941 **APTIC NO. 84534**

Matsuoka, Y., T. Takahashi, M. Morikawa, T. Matsumaru, and K. Shiratori

STUDIES ON VISIBLE INJURIES OF RICE PLANTS DUE TO PHOTOCHEMICAL OXIDANT. PART 1. IDENTIFICATION OF THE LEAF INJURY DUE TO PHOTOCHEMICAL OXIDANT. *(Kokagaku oxidant ni yoru suito kashishogai no kenkyu. Part 1. Kokagaku oxidant ni yoru yoshogai genin no rissho). Text in Japanese. Nihon Sakumotsu Gakkai Kiji (Proc. Crop Sci. Soc. Japan), 45(1):124-130, 1976. 31 refs.*

The cause of akagare disease-like symptoms on rice leaves accompanying the brown spots which began ot occur in summer 1969 in Chiba Prefecture was studied by a field survey and experiments. The results of the field survey indicated that the present symptoms are not due to any pathogenic parasite nor to any already reported akagare disease, but are presumably due to oxidant, one of air pollutants. Accordingly, rice plants were experimentally exposed to artificially produced ozone (a component of photochemical oxidant) at 0.15 ppm for 2 hr at a temperature of 30 C and relative humidity of 60 plus or minus 10%. The injury symptoms were quite similar to those observed in the field. No such injury appeared on rice plants grown in greenhouse into which only purified air was introduced in the same season when the akagare-like symptoms appeared on rice plants grown outdoors. It was concluded that the akagare disease-like symptoms on rice plant were due to oxidant injury.

61942 **APTIC NO. 84090**

Mayumi, Y. and F. Yamazoe

STUDIES ON THE PREVENTION OF COMPOSITE AIR POLLUTION PART 3. SUSCEPTIBILITY OF PLANTS TO AIR POLLUTANTS AND LIGHT CONDITIONS. *(Taiki fukugo osen boshi ni kansuru kenkyu 3. Osen-busshitsu ni taisuru shokubutsu no kanjusei to hikarijoken). Text in Japanese. Japan. Soc. Soil Sci. Manure Annu. Meet., 22nd, 1976, p. 154. (April.)*

Spinach plants grown under natural conditions in a/5000 pots were kept for 17 hr under illumination conditions at 29 Klux (outdoor), 29 Klux (in a room at 25 C, relative humidity of 70%) and 0 (in a dark room), and then exposed to ozone at 0.4 ppm and to a mixture of ozone (0.4 ppm) and sulfur dioxide (0.2 ppm and 0.4 ppm) under light conditions of 29, 17, 7 and 0 Klux. The strength of illuminations strongly affected the degree of spinach damage. In nearly the same experiment on spotted Chinese cabbage, the degree of damage due to a single gas was conspicuously lower in the plants kept at lower temperature and in darkness before exposure, but degree of damage due to gaseous mixtures was higher in plants kept at lower temperatures and darkness before exposure.

61943 **APTIC NO. 83083**

McLaughlin, S. B., V. J. Schorn, and H. C. Jones

A PROGRAMMABLE EXPOSURE SYSTEM FOR KINETIC DOSE RESPONSE STUDIES WITH AIR POLLUTANTS. *J. Air Pollution Control Assoc., 26(2):132-135, Feb. 1976. 4 refs.*

A programmable system for exposing plants to sulfur dioxide under controlled and reproducible concentration regimes is described. The system operates on the principle of feedback control whereby at any time the level of the porgrammed SO2 concentration can be compared with the actual concentration within the exposure chamber to determine the volume of SO2 injected into the chamber. Input and output signals are processed by a controller that continuously compares the two signals as a basis for actuating two low flow valves. The valves meter SO2 (3000 ppm) into the air supplied to the exposure chamber. Sample air continuously drawn from this chamber is analyzed to produce the output signal, which is fed back to the controller and concurrently recorded. The system is designed for investigating plant response to SO2, but is readily adaptable to studies involving other organisms as well as both individual and combined doses of other pollutants. (Author abstract modified)

61944 **APTIC NO. 83181**

Morikawa, M., Y. Matsuoka, T. Takasaki, and T. Shiratori

EFFECTS OF OZONE EXPOSURE ON THE PHOTOSYNTHETIC FUNCTION OF PADDY RICE PLANT PART 1. *(Suito no kogooseikino ni oyobosu ozone no eikyo sono 1). Text in Japanese. Japan Soc. Sci. Soil. Manure Annu. Meet., 22nd, 1976, p. 153. (April.)*

Twenty rice plants (variety Koshihihari) were planted in a Wagner pot with normal fertilization conditions. The plants with 5 true leaves were exposed to ozone at a predetermined concentration under artificial illumination (50 Kluc at 30 C for 6 hr) in a metabolic box to determine the rate of photosynthesis by absorption of carbon dioxide. The photosynthetic rate of paddy rice plants decreased with an increase in ozone exposure time. The relative rate is given as a function. The index of photosynthesis inhibition showed two different relationships to ozone concentrations lower and higher than 40 pphm, suggesting the existence of different mechanisms of inhibiting photosynthesis with the threshold value of 40 pphm. The fact that visible injury to the plants was noticed when the plants were exposed to ozone at more than 50 pphm indicates some relationship to the alternation of the index.

61945 **APTIC NO. 84504**

Nakamura, H., Y. Ota, S. Hashimoto, and H. Okino

ON THE DAMAGE OF RICE PLANT DUE TO PHOTOCHEMICAL OXIDANT PART 3. ANALYSIS OF GROWTH AND GRAIN YIELD BY THE AIR PURIFICATION METHOD. *(Kokagaku oxidant ni yoru ine no higai ni tsuite, Part 3. Kukijokaho ni yoru seiiku shuryo no kaiseki). Text in Japanese. Japan Crop Science Society, Crop Sci. Soc. Jap. Lect. Meet. 16th, 1976, p. 119-120. (April 2-3.)*

Potted transplanted seedlings of 4 varieties of rice plant were grown in an air purified plastic greenhouse and in an ordinary plastic greenhouse with free ventilation of outdoor air in 1950 when the occurrence of photochemical smog was severe in June and July. The growth inhibiting effect and effects of reducing grain yield of photochemical oxidant were clearly observed in all the varieties of rice plant. For instance, total aerial weight of plant, number of ears, total number of flowers and weight of unhulled rice of the plants grown in the air purified room were 120, 103, 108 and 113% respectively, of those plants grown in the room in which outdoor air freely circulated. These results were supported by the determination of photosynthesis during growth. Because the air pollutants in the testing site were mainly photochemical oxidant, the result of the present experiment demonstrates the effect of removing photochemical oxidant from air by filters and oxidizing agent (activated carbon and manganese dioxide).

61946 **APTIC NO. 84649**

Nouchi, I., T. Sawada, T. Ohashi, and T. Odaira

STUDIES ON THE INJURIES OF MORNING GLORY DUE TO PHOTOCHEMICAL OXIDANT. 1. OCCURRENCE OF MORNING GLORY INJURIES AND AIR POLLUTION BY OXIDANT. *(Asagao no kokagaku oxidant higai ni kansuru kenkyu. 1. Asagao higai hatsugen to oxidant osen). Text in Japanese. Tokyo to Kogai kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), vol. 1976:85-95, 1976. 16 refs.*

In order to determine the factors affecting the occurrence of oxidant injury of morning glory other than oxidant dose and to elucidate the mechanism of the injury occurrence, studies on the injuries of morning glory due to oxidant were carried out. The threshold dose of oxidant injury was 50 pphm (from 0900 to 1600) at a daily maximum of 8 pphm. Experimental results of exposing morning glory (Scarlet O Hara) were described as follows. The 6th and 7th leaves had resistance about 2-3 times greater than that of the resistance of generally susceptible leaves. In the plants in which the number of susceptible leaves was less than 2, no injury occurred unless the concentration of oxidant was very high; therefore, in areas where high concentration of oxidant frequently occurs, no injury would occur unless the oxidant was higher than 15 pphm. In spite of the abovementioned limitation, there was a good correlation in the regression equation between oxidant dose larger than 8 pphm and the amount of injury. Although many multifold regression equations containing air pollutants such as sulfur dioxide, nitrogen dioxide, and oxidant, and meteorological factors such as temperature, humidity, and wind velocity were prepared, they were inferior to the equation connecting oxidant dose larger than 8 pphm and the amount of injury.

61947 **APTIC NO. 84544**

Oda, Y., Y. Hirono, M. Idohara, and Y. Horie

EFFECT OF FIXATIVE AGENT IN PREVENTING TRANSLOCATION OF CADMIUM IN SOIL INTO RICE PLANT. *(Koteizai ni yoru dojuchu cadmium no ine e no ikoboshikoka). Text in Japanese. Anzen Kogaku (J. Japan. Soc. Safety Eng.), 15(2):105-110, 1976. 6 refs.*

Experiments were carried out on potted rice plants transplanted into soils subject to air pollution, water pollution, and alkaline pollution to determine the effect of 3 ALM 600 series fixative agents on preventing translocation of cadmium, copper, zinc, and lead from such soils into the plants. The results showed that when ALM was added previously to the soil at 0.1-0.5%, the uptake of cadmium by brown rice was reduced by 83%. The preventive effect was more pronounced in soil polluted by water than in soil polluted by air. No effect of adding ALM to soil was found on the rice yield or on the taste of the rice, indicating that there is a possibility of utilizing ALM in improving the polluted paddy field. Although there was some effect of preventing uptake of copper, no effect was observed on the passage zinc and lead from soil into rice grains.

61948 **APTIC NO. 84503**

Okino, H. and Y. Ota

ANALYSES OF AGRICULTURAL CROP DAMAGE DUE TO AIR PO LUTION PART 2. EXAMINATION BY PLANT-DEPOSITING METHOD USING SOYABEAN. *(Taikiosen ni yoru nosaku butsu higai ryo no kaiseki Part 2. Daizu ni yoru haichi ho no kento). Text in Japanese. Japan Crop Science Society, Crop Sci. Soc. Jap. Lect. Meet. 16th, 1976, p. 123-124. (April 2-3.)*

The growth of soya bean plants planted in Konosu City, Saitama Prefecture and in Utsunomiya City, Tochigi Prefecture and grown by hydroponics were examined in relation to planting density, varietal difference, meteorological conditions and occurrence of photochemical oxidant. During the 3 wk of growing, the temperature, sunshine, and photochemical oxidant were higher in Konosu by 1.9 C, 170 cal/day with frequent occurrence of photochemical oxidant over 15 pphm. Visible injury symptoms were seen only on the leaves in Konosu. The increment of plant dry weight, chlorophyll content of leaves, and the leaf area were apparently larger in plants deposited in Utsunomiya. Relative growth rate and assimilation rate determined every week were consistently larger in plants in Utsunomiya, showing negative correlation to oxidant dose. There were varietal differences in visible symptoms. There was a close relationship between the varietal differences in visible symptoms and the rate of leaf area reduction. The visible injuries were more severe in the more lightly planted plots.

61949 **APTIC NO. 84502**

Ota, Y., M. Nakayama, and H. Okino

ON THE INDEX PROPERTY OF SESAME PLANT FOR ETHYLENE AS AN AIR POLLUTANT. *(Taikiosen busshitsu to siteno ethylene in taisuru goma no shihyosei ni tsuite). Text in Japanese. Japan Crop Science Society, Crop Sci. Soc. Jap. Lect. Meet. 16th, 1976, p. 125-126. (April 2-3.)*

Since the effects of ethylene in auto exhaust on plants have not yet been studied, the index properties of sesame plants for ethylene were experimentally investigated. Inflorescent sesame plants were exposed to ethylene at 0.1, 1, and 10 ppm, respectively for 1, 4, and 16 hr. It was observed that conspicuous flower-bud falling and epinasty of upper leaves occurred on the plants exposed for 16 hr, and that the action of bud-falling of ethylene appeared on the buds just before inflorescence and not on completely opened flowers. Ethylene at higher concentration affected even smaller buds. In another experiment, potted sesame plants were deposited along a motor road at distances of 2, 4, 8, 16, and 50 m. The determination of ethylene along the road revealed that the concentration of ethylene increased as the distance from the road decreased. In actual fields of sesame crop, the rate of falling of flowers and capsules increased as the distance from the road decreased. The sesame plant is useful as a plant indicator of atmospheric ethylene.

61950 **APTIC NO. 84642**

Ota, Y.

AKAGARE, A VISIBLE SYMPTOM OF RICE PLANT DUE TO PHOTOCHEMICAL OXIDANT. *(Kokagaku oxidant ni yoru ine no akagare). Text in Japanese. Shokubutsu Boeki (Plant Prot.), 30(6):219-222, June 1976. 7 refs.*

Specific features of the Akagare of rice plant which is due to exposure to photochemical oxidant and which resembles physiological diseases and those of Akagare Type I-III were compared. The specific outlook of the former consist of symptoms occurring over a broad area simultaneously, mainly on the upper surface of the second developed leaf, as minute spots reddish brown in color, regardless of fertilization and soil conditions. Its occurrence is transient without further infection to healthy parts or to developing leaves. The symptoms usually occur 1-2 days after the occurrence of photochemical oxidant of high concentration. Microscopically, the spots are formed with stomata as a center and with discolored necrosis of cells around the stoma and the neighboring mesophyllic cells, and other clear fringed spots, brown or yellowish white, are seen with stomata as centers. The most susceptible season is that of the most actively tillering stage. Physiological Akagare Types I and II show similar leaf spots; however, their position of occurrence has no relationship to the stomata. In the case of Physiological Akagare Type III, the mesophyllic tissue and that just beneath the stoma are intact. The yellowish white spots are not seen in any type of physiological Akagare. Scanning electron microscopy reveals many open stomata on leaves attacked by photochemical oxidant. Rice plants experimentally exposed to ozone at 0.15 ppm for 1-2 hr showed just the same symptoms as those experienced in the photochemical oxidant damage. The effect of such visible symptoms due to photochemical oxidant, especially ozone, on the growth and yield of rice plant and rice grain remains to be studied.

61951 **APTIC NO. 81495**

Pack, M. R. and C. W. Sulzbach

RESPONSE OF PLANT FRUITING TO HYDROGEN FLUORIDE FUMIGATION. *Atmos. Environ., 10(1):73-81, 1976. 20 refs.*

Plants of 10 species representing important crops grown primarily for fruit or seed production were exposed to hydrogen fluoride gas in growth chambers. Soybean produced almost no seeds under continuous exposure to HF at a concentration of 0.64 micrograms fluoride/cu m, whereas cotton showed no apparent effects at 8.0 micrograms fluoride/cu m. Bell pepper, sweet corn, cucumber, pea, grain sorghum, oat, wheat, and barley ranked between soybean and cotton in order of decreasing sensitivity of fruiting to HF exposure. Development of fewer seeds was the most common response of fruiting to HF. Flower development was inhibited on pepper and corn plants. The effects on fruiting were apparently independent of HF injury to plant foliage. (Author abstract modified)

61952 **APTIC NO. 84579**

Sakurai, S., K. Itai, and F. Tsunoda

STUDIES ON AIR POLLUTION DUE TO FLUORIDES. PART 17. ON THE NORMAL CONCENTRATION OF FLUORINE IN PLANTS. *(Jukkabutsu ni yoru taikiosen ni kansuru kenkyu XVII. Shokubutsu chu fusso nodono tsujochi ni tsuite). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 31(1):174, April 1976.*

The normal concentration of fluorine in 3 indicator plants and crops grown in an area where total fluoride was less than 0.05 microgram F/cu m is reported. In iris, the content of F in upper, middle, and lower leaves was respectively 4.21 (8.88-1.68), 2.81(6.35-0.75), and 1.89 (4.00-0.80) ppm. In pine needles it was 2.95 (5.86-1.10), 3.83(6.25-1.91), and 4.61 (6.46-2.56) respectively in first-year, second-year and third- year needles, showing yearly increases. There are also cases where the content differs from spring to autumn. The leaves of samellia a(as tea leaves) contained high amounts of fluorine ranging from 90 to 600 ppm.

61953 **APTIC NO. 83530**

Sheline, Jonathan, Roland Akselsson, and John W. Winchester

TRACE ELEMENT SIMILARITY GROUPS IN NORTH FLORIDA SPANISH MOSS: EVIDENCE OF DIRECT

UPTAKE OF AEROSOL PARTICLES. J. Geophys. Res., 81(6):10471055, Feb. 20, 1976. 18 refs.

The elemental composition of 10 samples of Spanish moss (Tillandsia usneoides L.) collected mainly in forested areas near Tallahassee, Florida, was compared to the composition of the ambient aerosol particle background in the forest, measured as a function of particle size. For forest samples, moss composition was similar to the composition of aerosol particles greater than 0.5 micron diameter for the elements sulfur, chlorine, titanium, vanadium, iron, nickel, zinc, bromine, lead, and possibly copper. Elements relatively enriched in the moss fell into two groups: potassium, rubidium, and zirconium; and calcium, strontium, and manganese, based on detailed association patterns. No evidence was found for an enrichment, relative to the ambient aerosol, of pollution derived elements Pb, Br, V, and Ni, although those elements were found at higher concentrations in moss samples from locations nearer roadways or oil-fired power plants. The moss has potential value as an indicator of time average aerosol composition for particles of greater than 0.5 micron, except for the enriched elements, which may have longer biological retention times. (Author abstract modified)

61954 **APTIC NO. 84562**

Shigekatsu, H. and S. Homma

ENVIRONMENTAL POLLUTION IN ANNAKA AND SERICULTURE. *(Annaka Kogai to Yosan). Text in Japanese. Preprint, General Research Society for Environmental Science, Japan, p. 18-19, 1976. (Presented at the Environmental Science Meeting, 2nd, Tokyo, Japan, June 4, 1976.)*

It has been demonstrated that mulberry leaves containing more than 10 ppm cadmium kill silkworms, and those containing more than 2500 ppm zinc injure the worms. Since improvements of the exhaust-treating apparatus were completed at the Annaka refinery, the cadmium and zinc content of falling dust from the refinery is one tenth that of 1968-1969. To determine the actual state of mulberry leaf pollution, a sericultural experiment was carried out. Silkworms were fed with three samples of mulberry leaves containing cadmium, zinc, and lead respectively, as follows (in ppm): (A) 1.18, 203, and 11.9 (B) 1.19, 100, and 9.9 and (C) 0.14, 41, and 5.8 ppm (fed from 4 instar). The growth of 5 instar was delayed by ingestion of more severely polluted leaves. The weight of cocoons, the weight of the silk layer of the cocoon, and the ratio of silk layer to cocoon were, respectively, (A) 1.59 + or - 0.22 g, 0.38 + or - 0.05 g, and 24.10 + or - 2.82% (B) 1.72 + or - 0.26 g, 0.41 + or - 0.04 g, and 24.00 + or - 2.87% and (C) 1.83 + or - 0.23 g, 0.44 + or - 0.04 g, and 24.23 + or - 2.53%. Even after the improvements, mulberry pollution is still continuing (mulberry leaves of C were collected far from the refinery), and still has some effect on sericulture.

61955 **APTIC NO. 84091**

Shinozaki, M., E. Iwamura, and M. Maeno

EFFECTS OF OZONE EXPOSURE ON THE RATE OF PHOTOSYNTHESIS OF CROPS. *(Ozone sesshoku ni yoru nosakumotsu no kogosei sokudo eno eikyo). Text in Japanese. Japan. Soc. Soil Sci. Manure Kanto Branch Meet., 1974-1975, p. 55, 1976.*

The effects of ozone exposure on the rate of photosynthesis were studied using potted spinach and rice plants by testing the effect of ozone exposure on the growth and yield of the crops. For spinach, exposure to ozone at 5-10 pphm for 90 min and at 10 pphm for 90 min did not affect the rate of photosynthesis; the rate did decline during exposures of 15-20 pphm for 45 min, and was still further reduced (about 20-40%) at 200 pphm. The exposed rice plants were grown to harvest outdoors. A small reduction of the yield of polished rice grains and a little increase in the number of unsatisfactory grains was found.

61956 **APTIC NO. 84511**

Suzuki, K.

EFFECTS OF AIR POLLUTION OF TREES. *(Taikiosen no jumoku ni eikyo). Text in Japanese. Gumiin Eiji (Green Age), 3(4):38-44, April 1976.*

The effects of air pollution on trees in the Kawasaki industrial district is described. The air pollution in this city has been significant since 1959, reached a peak in 1966-1967, and then showed a tendency to decrease. The distribution of tree species is important and interesting because it shows the species-specific-response of trees to air pollution. Those abundant in places near pollution sources were poplar, ginkgo, Salix babylonica, Robinia pseudo-acacia, Nerium indicum, and some quercus and pasania species. The symptoms on leaves due to air pollution were peripheral browning of ginkgo leaves and apex- browning of older leaves and abnormal thinness of new leaves of Pasania edulis. The effect of air pollution also appeared in growth inhibition of ginkgo and Pasania. The increase of sulfur content of leaves, especially ginkgo, was noted. The effect of air pollution also appeared as the seemingly mechanical injury of branches of trees relatively resistant to air pollution.

61957 **APTIC NO. 83722**

Taniyama, T.

ON THE REDUCTION OF GROWTH AND YIELD OF CROPS IN A FIELD POLLUTED BY HEAVY METALS DUE TO THE EXHAUST FROM A ZINC REFINERY IN ANNAKA CITY, GUMMA PREFECTURE. *(Aen seiren kojo Gummaken, Annaka shi ni yoru jikinzoku to osennochi ni okeru sakumotsu no seiiku, shuryo no gentai ni tsuite). Text in Japanese. Nihon no Kagakusha (Japan. Sci.), 11(1):37-41, 1976. 8 refs.*

Experimental results on the effects of heavy metals in the soil around a zinc refinery on the growth and yield of barley pasturage and upland and lowland rice are described. The yield of barley grain fell as the heavy metal contents increased. In the case of concentration of cadmium, lead, and zinc, larger than 15, 147, and 936 ppm, respectively, the yield was nil. In soils in which the heavy metals content was not so large, the application of manure encouraged better growth and yields of barley. The growth and yield of Italian rye-grass, radino clover, and upland and lowland rice were affected by heavy metals in the soil: as much as 75% for Italian rye grass and 100% for other crops. Chlorosis was found in upland rice in a polluted field. The deposition and accumulation of heavy metals from the exhaust of the zinc refinery polluted the soil in the fields around the refinery and reduced the productivity of the soil, especially in severely polluted soil, where the yield was zero.

61958 **APTIC NO. 84512**

Taniyama, T.

ACTUAL CONDITIONS OF CROP DAMAGE DUE TO GASEOUS SULFUR DIOXIDE AND STUDIES ON THE MECHANISM OF THE DAMAGE. *(Sakumotsu no aryusan gasu shogai no jittai to sono kiko nikansuru kenkyu). Text in Japanese. Japan Crop Science Society, Crop Sci. Soc. Jap. Lect. Meet., 16th, 1976, p. 189-190. (April 2-3.)*

Two major types of crop damage due to sulfur dioxide (visible damage to leaves and stems, and invisible damage which affects photosynthesis and respiration, resulting in reductions of dry matter and seeds) were studied experimentally from the viewpoint of photosynthesis, respiration in the dark, production of dry matter and seeds, and morphological formation, to elucidate the mechanism of yield reduction. Smoky white or grayish white spots on leaves of exposed plants such as rice, rape, wheat, and maize, were due to sulfur dioxide absorbed from stomata, and brown or reddish smoky spots were due to the absorption of mists of sulfurous or sulfuric acid formed from sulfur dioxide. Rice plant was more resistant to the gas than rape, clover, orchard grass, or tobacco. Sulfur dioxide inhibited photosynthesis of paddy rice, rape, and rye at concentrations over 0.05 ppm, the inhibition being larger as the concentrations was higher. Inhibition of photosynthesis by sulfur dioxide became less in the following order of stages: earing and flowering, tillering, and milky and maximum tillering. The NAR and the increment of dry matter as wll as photosynthesis were also reduced as the concentration of sulfur dioxide increased. The greater the duration of contact with sulfur dioxide, the larger the reduction of dry matter formation. Sulfur dioxide delayed earing of rice plant and caused the formation of unfertilized rice, resulting in the reduction of the number of ears and the number of seeds/plant. These effects were observed in paddy fields in the Yokkaichi area and coincided with the occurrence of human Yokkaichi asthma.

61959 **APTIC NO. 84533**

Taniyama, T., K. Yamashita, and T. Koike

STUDIES ON CROP INJURIES DUE TO GASES. PART 13. EFFECTS OF AN AIR POLLUTANT, OZONE, ON THE PHOTOSYNTHESIS OF MAIZE, RICE AND PEANUT PLANTS. *(Sakumotsu no gas shogai ni kansuru Kenkyu. Part 13. Taikiosen butsushitsu, ozone gasu (O3) ga tomorokoshi, suito oyobi rakkasei no kogosei ni oyobosu eikyo). Text in Japanese. Nihon Sakumotsu Gakkai Kiji (Proc. Crop Sci. Soc. Japan), 45(1):9-16, 1976. 15 refs.*

The effects of ozone at 0.1, 0.2, 0.5, 1, and 5 ppm, respectively on the photosynthesis of potted plants of maize (Goldencross bundum), rice (Manryo), and peanut (Norin No. 1) were examined by exposing an area of the plant leaf to ozone for 2 hr and then determining the apparent rate of photosynthesis for 2 hr on maize and rice, and for 1 hr on peanut. As ozone concentration increases, the inhibition of rate of apparent photosynthesis increases on all the plants, the inhibition being observed at 0.1 ppm on rice and maize. With regard to the rate and the degree of inhibition, the effect of ozone was strongest on peanut, followed by rice then by maize. With regard to visible injuries, the effect of ozone was strongest on peanut followed by rice then by maize. After exposing the ozone-exposed plants to natural air the inhibited rate of photosynthesis was not recovered in maize, partially recovered in rice, and inhibited further in peanut. As visible damage was aggravated, inhibition of photosynthesis developed in peanuts. When the inhibition of photosynthesis reached 70%, visible damage to leaves appeared on 65% of plants of rice and maize. From these findings, it was concluded that invisible injury was largest in rice, followed by maize, and then by peanut. Visible injury due to ozone appeared on peanuts at 0.2 ppm, showing the usefulness of peanuts as plant indicators of ozone.

61960 **APTIC NO. 84565**

Taniyama, T.

THE CHARACTERISTICS OF THE INVIRONMENTAL POLLUTION IN A POLLUTED AREA OF ANNAKA CITY DUE TO SULFUR OXIDES AND HEAVY METALS, SEEN FROM THE PLANT DAMAGE. *(Iosanka butsu jukinzoku osenchiiki, Annaka City, ni okeru shokubutsu higai karamita osen no tokucho). Text in Japanese. Preprint, General Research Society for Environmental Science, Japan, p. 12-13, 1976. (Presented at the Environmental Science Meeting, 2nd, Tokyo, Japan, June 4, 1976.)*

The exhaust of a zinc refinery in Annaka city containing sulfur oxides, heavy metals, nitrogen oxides, and dusts has polluted the neighboring fields since 1937. Before and even after the construction of higher smoke stacks the plants around the refinery were attacked by violent winds containing higher concentrations of air pollutants. A survey of withered trees was carried out: diameter, species, distance from the pollution source, and the time of withering were recorded. It was found that Prunus nume dating from 1945-1955, Prunus yedoensis and rhododendrons from 1950, oaks during 1950-1960, abieses, Zelkova serrata, and Cryptoneria japonica since 1960 had withered; there was especially conspicuous withering of C.j. Withering of Chamaecyparis obtusa, pine trees, and Castanea crenata began from about 1965. These results reflect the susceptibility of different plants to sulfur dioxide.

61961 **APTIC NO. 84566**

Taniyama, T.

CROP YIELD INDEX AND DEGREE OF POLLUTION IN FIELD POLLUTED BY SULFUR OXIDES AND HEAVY METALS FROM ANNAKA CITY. *(Io sankabutsu jukinzoku to osen nochi, Annaka city, ni okeru sakumotsu no shuryoshisu to osendo). Text in Japanese. Preprint, General Research Society for Environmental Science, Japan, p. 10-11, 1976. (Presented at the Environmental Science Meeting, 2nd, Tokyo, Japan, June 4, 1976.)*

Experiments were carried out on the relationship between reduction of crop yields and soil polluted by the exhaust of the Annaka metals refinery. The crops were barley, upland rice, and pasturage such as ladino clover and Italian rye grass. According to the results of experiments in fields and with potted plants, the mechanism of yield reduction is explained by the fact that almost all the sulfur oxides and nitrogen oxides absorbed from air were absorbed by the leaves, and most of the heavy metals were absorbed by the roots and accumulated in the plant body. These absorbed materials inhibited the root growth, resulting in reduction of absorption of nutrients, then reduction of photosynthesis. The absorbed heavy metals caused chlorosis in paddies and upland rice plants, resulting in a reduction in photosynthesis/leaf area, as well as a reduction of tillering. In plants grown for seeds, such as rice, a reduction of the ripening rate (number of ears/plant), the number of flowers/ear, and the weight of grains as well as deterioration of the grains (greenish or brownish rice grains) occurred.

61962 **APTIC NO. 83653**

Tatekawa, H., T. Sugano, and S. Saito

ANALYTICAL STUDIES ON CROP DAMAGES DUE TO SOIL POLLUTED BY HEAVY METALS; CHARACTERISTICS OF RICE PLANTS TOWARD CADMIUM BY AIR POLLUTION. *(Jukinzoku dojo osen ni yoru nodakubutsu higai no kaiseki ni kansuru kenkyu Part 11; taiki-gata osen ni yoru suito no cadmium kyushu tokusei). Text in Japanese. Japan Soc. Soil Sci. Manure Annu. Meet., 22nd, 1976, p. 154. (April.)*

The contamination of brown rice in an air-polluted area by falling cadmium was studied. Cadmium from the pollution source was measured. The contamination of brown rice from 1972 to 1973 was studied using pot cultures and rice fields. When cadmium was absorbed at the leaf surface, it was most abundant in the leaf blade, followed by the leaf sheath, the stem, and the brown rice grain; the state of distribution was different from that when cadmium was absorbed by the root. When grown in flooded fields all through the cultivation period, the cadmium content of brown rice due to falling cadmium was 0.14-0.19 ppm; when grown with intermittent irrigation, the content was 0.28 ppm. The percentage of contamination of brown rice by falling cadmium was 30% before earing and 70% after. The ratio of water soluble sulfur to total sulfur in the leaf blade and the stem of the rice plant was determined. Parallelism of pollution by cadmium, copper, zinc, lead, and sulfur dioxide was found.

61963 **APTIC NO. 84643**

Terakado, K. and H. Hatta

SEVERAL POINTS NOTICED IN THE CITIZEN S MOVEMENT OF OBSERVATION ON THE PLANT INDICATOR OF AIR POLLUTION. *(Shihyoshokubutsu o tsukatta shimin ni yoru kansatsu undo no nakakara kizuita ten). Text in Japanese. Preprint, General Research Society for Environmental Science, Japan, p. 124-125, 1976. (Presented at the Environmental Science Meeting, 2nd, Tokyo, Japan, June 4, 1976.)*

The utilization of plant indicators which could be used anywhere was explored. Experiments were carried out using morning glory (Scarlet O Hara), which belongs to a group of plants highly sensitive to oxidant (mainly ozone) and can be grown anywhere by anyone. The plant shows injury when exposed continuously for more than 3 hr to oxidant at 0.08 pphm with a high correlation between damaged leaf area and accumulated oxidant dose. The degree of injury was classified into 5 classes, and the injury was recorded daily by volunteer inhabitants. The injury was divided into two classes with the position of injured leaves. The method of sketching the injured leaves once a week was accurate, although it is difficult to know the state of injury quickly. There are some fluctuations in the observed results which makes the identification of specific pollution sources difficult.

61964 **APTIC NO. 84535**

Teranishi, K., K. Hamada, and H. Watanabe

BIOLOGICAL TEST SYSTEMS OF CARCINOGENS IN AIR. *(Taikichu hatsugan butsushitsu no seibutsugakuteki kensaho). Text in Japanese. Taikiosen Kenkyu, (J. Japan. Soc. Air Pollution), 10(6):745-752, 1976. 25 refs.*

A method of quantitatively evaluating carcinogenicity of air pollutants utilizing back mutations of bacteria such as TA1535 LT-2strain (his minus, delta UVrB rfa), TA1536, and TA1537. The relationship between the carcinogenicity and the mutagenicity of polynuclear aromatic hydrocarbons known to be carcinogens was examined. There is a quantitative correlation between the carcinogenicty of polynuclear aromatic hydrocarbons and the frequency of mutation in the TA1538 strain. Using the correlation, the carcinogenicity of air pollutants collected along the roadside was examined and the carcinogenicity deduced from the mutagenicity was much larger than that calculated. Tarry matter in the exhaust of a factory showed strong mutagenicity toward the TA1538 strain, suggesting the existence of strong mutagen(s) in the exhaust. Other examples of suspected carcinogens which are known to induce mutations or chromosome abberation were cited.

61965 **APTIC NO. 84244**

Togeda, H.

SURVEY OF AIR POLLUTION BY EPIPHYTES. *(Chakusei shokubutsu ni yoru taikiosen chosa). Text in Japanese. Environ. Inform. Sci. Center: Symp., 1976, p. 19-26.*

Plant species useful as indicators of the degree of air pollution are described. Epiphytes are useful because they depend entirely on rainwater which is absorbed by the whole body of the plant directly; they grow slower than higher plants and require a long time to recover from damage; and they are perennial evergreen plants receiving the effects of air pollution through the year. Maps were made showing epiphytes of different resistance to air pollutants. The method of Desloover and Le Blanc of obtaining I.A.P. was used. Four survey areas are described: Tokyo, Banda; (Fukushima Prefecture), Ichihara (Chiba Prefecture), and Kobe (Hyogo Prefecture).

61966 **APTIC NO. 84528**

Tsuno, Y. and T. Sato

PINE TREE GROWTH AS INFLUENCED BY A POLLUTED ATMOSPHERE. I. THE SYMPTOMS OF GROWTH SINKING OF PINE TREES IN A POLLUTED AREA. *(Taikiosen chiiku ni okeru matsu no suijakuchoko to sono suryoka ni yoru higai kantei ho part I. Taikiosenchiiki ni okeru matsu no suijaku choko). Text in Japanese. Tottori Daigaku Nogakubu Sakyu Kenkyu Jikkensho Hokoku (Bull. Sand Dune Lab. Tottori-shi Univ.), no. 15:21-28, 1976.*

The growth of pine trees in non-polluted areas and in air polluted areas was compared. The chief characteristic of pine trees in polluted areas was a high rate of leaf fall, as well as many brown leaves. The characteristics of pine trees in air polluted areas included the disappearance of apical dominance in younger trees, drooping twigs and a frequent appearance of twigs without leaves. Pinus densiflora (3 years old) was exposed to sulfur dioxide at several concentrations for 30 minutes; the brown leaves appeared at more than 3 ppm of sulfur dioxide. The reduction of photosynthesis appeared at 1 ppm, and it took 5-38 hr for the acitivity to recover to levels present before the exposure. Exposure in high humidity caused the inhibition of photosynthesis to be more severe.

61967 **APTIC NO. 84567**

Tsuno, Y., T. Sato, and M. Kiyasu

PHYTOMETER OF BUCKWHEAT AS AN INDICATOR OF AIR POLLUTION. *(Soba-yoshokubutsu o mochiita taikiosen kenshutsuyo shokututsu kei no kaihatsu to sono oyorei). Text in Japanese. Tottori Daigaku Nogakuba Sakyu Kenkyu Hokoku (Bull. Sand Dune Lab. Tottori-shi Univ.), no. 15:9-20, 1976. 12 refs.*

The requirements of a phytometer sensitive enough to measure air pollution are discussed. The sensitivity of Fagopyrum esculentum to air pollution is mentioned in detail and a phytometer utilizing young F.e. plants specially developed is explained along with the method of calculation net assimilation rate (NAR) of the plants. Several factors affecting the growth rate of young buckwheat plants are discussed. The plants were kept in places with different degrees of air pollution in Matsuyama city to determine the dry weight, leaf area, relative growth rate, NAR relative area of leaves. It was concluded that the reduction of relative growth rate of the plants in air polluted areas was due to the reduction of NAR rather than to the reduction of relative leaf area.

61968 **APTIC NO. 84586**

Tsuno, Y. and T. Sato

PINE TREE GROWTH AS INFLUENCED BY A POLLUTED ATMOSPHERE. II. ESTIMATION OF THE GROWTH DECLINE OF PINE TREES BY EXAMINING THE EXTERNAL DAMAGE IN TREES AFFECTED BY A POLLUTED ATMOSPHERE. *(Taikiosenchiiki ni okeru matsu no suijaku choko to sono suryoka ni yoru higaido hanteiho. 2. Suijaku chokono suryoka ni yoru higaido no hyoji to chosa jirei). Text in Japanese. Tottori Daigaku Nogakuba Sakyu Kenkyu Hokoku (Bull. Sand Dune Lab., Tottori-shimu Univ.), no. 15:29-36, 1976. 8 refs.*

The signs of decline of pine trees in heavily air polluted areas are elucidated. A system of points was used for evaluation of decline. A clear and significant difference of point count between pine trees in clean air areas and polluted areas was found. Pinus densiflora was exposed to several concentrations of sulfur dioxide for 30 min. The trees which showed more severe temporary reduction of photosynthesis also showed delay of recovery of photosynthesis. At the same concentrations of sulfur dioxide, the inhibition of photosynthesis was stronger when the moisture content of the atmosphere was higher.

61969 **APTIC NO. 83858**

Ueki, H. and S. Nakazawa

ON THE EFFECTS OF OZONE ON A VARIETY OF ALLIUM FISTULOSUM PART 1. EFFECT OF SOIL MOISTURE ON THE APPEARANCE OF DAMAGE. *(Wakegi ni oyobosu ozone no eikyo ni tsuite I. Dojosuibun no tasho ga Wakegi no shogai hatasugenni oyobosu eikyo). Text in Japanese. Japan. Soc. Soil Sci. Manure, Kansai Branch Meet., 1974 - 1975, vol. 1974:77, 1976.*

Experiments were carried out on a variety of Allium fistulosum grown for 45 days in pots with a soil moisture of PF 2.0. The soil moisture content was regulated to 5 levels of PF (1.5, 2.0, 2.7, 3.5 and 4.0), and potted Allium plants were exposed to ozone at 0.255 ppm at 28 + or - 1 C, RH 73 + or -

2%, for 7 hr. Damage due to ozone appeared most severely in soil with moisture contents of PF 1.5 and 2.0; at soil moisture contents of PF 3.5 and 4.0, almost no symptoms appeared. The threshold moisture content for showing signs of damage was a PF between 2.7 and 3.5. When soil moisture content was changed from PF 3.5 to 1.5 or PF 1.5 to 3.5, the effect of moisture content just before ozone exposure was greater. The effects of soil moisture are related to the stomatal aperture, which becomes larger when the moisture content of the soil increases, allowing greater ozone damage. When the aperture was smaller than 1.2 micron, the damage was smaller. In order to reduce ozone damage to the Allium variety it is preferable to keep the soil a little dry.

61970 **APTIC NO. 83644**

Ushijima, T.

COMPONENTS OF THE ATMOSPHERE AND THE GROWTH OF PLANTS. FACTORS WHICH CONTROL THE RATE OF FIXING CARBON DIOXIDE. *(Taikiseibun to shokubutsu no seicho. CO 2 koteino o rissokusuru mono). Text in Japanese. Kagaku to Seibutsu (Chem. Biol.), 14(1):18-19, Jan. 1976. 5 refs.*

Photosynthesis is discussed in terms of trends toward an increase of atmospheric carbon dioxide (290 ppm in 1900, and 314.5 ppm in 1960). The gradual increase of atmospheric carbon dioxide leads to fears of meteorological changes. The difference of the rate of carbon dioxide fixing between C4 plants and C3 plants is discussed. There are some trace substances in air which inhibit the growth of plants, including sulfur dioxide, nitrogen oxides, and ozone. Because the increase of atmospheric carbon dioxide is attributed to industrial activity, there is a possibility for increases of trace components. The compound effects and physical inorganic factors the minute global fluctuations of atmospheric composition may also have ill effects on plant growth.

61971 **APTIC NO. 84563**

Ushijima, T., A. Sato, Y. Fukushima, and T. Tazaki

EFFECTS OF SULFUR DIOXIDE ON PHOTOSYNTHESIS AND RATE OF TRANSPIRATION OF PLANTS. *(Shokubutsu no kogosei oyobi josansokudo ni taisuru SO 2 no eikyo). Text in Japanese. Preprint, General Research Society for Environmental Science, Japan, p. 48-49, 1976. (Presented at the Environmental Science Meeting, 2nd, Tokyo, Japan, June 4, 1976.)*

Potted sunflower plants were exposed to sulfur dioxide at 0.25-0.3 ppm (a concentration which gave no visible damage), at 23 C + or - 2 C and relative humidity of 60%. Only two opposite leaves were exposed, and the change of photosynthesis and the transpiration was determined. The reduction of photosynthesis and transpiration began to occur very rapidly; however, the inhibitory ratio became constant thereafter, and when the leaves were exposed to fresh, pure air after 60 min, the photosynthesis and transpiration began to recover, first the stomata, then respiration and then photosynthesis. The inhibition of photosynthesis was greater on the leaves that were more active in photosynthesis. Sulfur dioxide seemed to directly inhibit the carbon dioxide fixing system. It is suggested that sulfur dioxide, at even very low concentrations, is constantly inhibiting the growth of plants, especially agricultural crops.

61972 **APTIC NO. 83797**

Yamazoe, F.

EFFECTS OF FLUORINE COMPOUNDS AS AIR POLLUTANTS ON PLANTS. *(Taikiosen busshitsu to site no fukkabutsu no shokubutsu eno eikyo). Text in Japanese. Rodo no Kagaku (Dig. Sci. Labor), 31(4):22-27, April 1976. 3 refs.*

Fluorine compounds as air pollutants are mainly hydrogen fluoride and silicon tetrafluoride, and they are known to be highly toxic to plants at concentrations as low as ppb-pphm levels. The order of toxicity to plants runs HF, silicon tetrafluoride, sodium hydrogen fluoride, sodium fluoride, sodium aluminum fluoride, and calcium fluoride. The susceptibility of plants to hydrogen fluoride was classified into categories: those showing injury after exposure for 7 to 9 days at less than 5, at 5-10, and at more than 15 ppb. The most susceptible plant is gladiolus, which is utilized as an indicator plant for hydrogen fluoride. The Adams s exposure factor (average concentration in ppm multiplied by exposure period in hours) is introduced. The symptoms of fluoride injury were peripheral oily immersion, chlorosis, then browning of the leaves. In severer cases, necrosis appeared. A description is given of the mechanism of fluorine injury; it concerns the translocation of fluoride ions in the plant body. Analytical methods of determining fluorine in plants and measures for reducing the damage due to fluorides are described.

61973 **APTIC NO. 83254**

Yanagisawa, S.

DAMAGE TO PLANTS IN TOKYO DUE TO NUISANCE, DISEASES, AND INJURIES. *(Tokyo no shokubutsu to Kogai, byogai, saigai). Text in Japanese. Shokubutsu to Shizen (Plants and Nature), 10(1):30-31, 1976. 4 refs.*

Damage to trees in Tokyo Metropolis due to exhaust polluted air and meteorological abnormality is described. The plants which are resistant to polluted air and have grown in Tokyo include Pasania edulis, Nerium indicum, Ternstroemia japonica, Eunonymous japonicus, Fatsia japonica and Ginkgo biloba. For resistance to diseases and meteorological factors, the most successful species is Platanus, followed by Ginkgo then by Salix babylonica. The symptoms of trees due to polluted air include the disappearance of their epiphytic mosses and lichens, untimely leaf-fall, absence of flowers, yellowish-white coloration of leaves, and withering.

61974 **APTIC NO. 84550**

Yokobori, M.

AIR POLLUTION AND TREES, FROM THE RESULTS OF STUDIES IN THE FORESTRY EXPERIMENT STATION. *(Taikiosen to Jumoku, Ringyoshikenjo no kenkyuseika kara). Text in Japanese. Ringyo Ibaraki (Forestry Ibaraki Pref.), vol. 1973:6-7, May 1, 1973.*

Results of studies on the effects of sulfur dioxide on Pinus thunbergii and P. densiflora which appeared as leaf-discoloration, decrease of numbers of leaves, yearage of leaves on the tree, state of pest infestation, sulfur content of the leaves, and nutritive state of the leaves are presented. The pine trees selected for the study have grown as forests around the artificially constructed part of Kashima including the coastal industrial zone. The sulfur content of pine leaves showed nearly the same local distribution as the distribution of sulfur dioxide concentration in the air around the park, indicating that the leaves absorb sulfur dioxide from the air and the absorbed sulfur has accumulated in the leaves. The discoloration of leaves was more conspicuous in P. densiflora than in P. thunbergii in spite of the high content of sulfur also found in P. thunbergii. From the amount of leaves and yearage of leaves, P. thunbergii seems to be more resistant to sulfur dioxide than P. densiflora. Pinus thunbergii is a more suitable plant indicator for sulfur dioxide than P. densiflora.

61975 **APTIC NO. 84595**

Yoshioka, K.

INVESTIGATION AND SURVEY ON THE EFFECTS OF AIR POLLUTION ON AGRICULTURAL CROPS AND HUMAN BEINGS. *(Taiki osen (Kogai) ga nosakubutsu to ningen ni oyobosu eikyo). Text in Japanese. Preprint, General Research Society for Environmental Science, Japan, p. 58-59, 1976. (Presented at the Environmental Science Meeting, 2nd, Tokyo, Japan, June 4, 1976.)*

The value of observing the response to pollution of plants which live a long time in one place is discussed. The reduction

of rice grain yields due to oxidants near the Mizushima coastal industrial zone is described. Oxidants during the flowering of rice plants in 1975 caused whitening of the ear-apex area, resulting in partial sterility. Damage to pine trees, rice plants, vegetables, and fruits shows a consistent relation to incidence of human asthma.

61976 APTIC NO. 83850

RESULTS OF BOTANICAL SURVEY OF FORESTS AS ENVIRONMENTAL INDICATOR. *(Kankyoshihyo no mori shokubutsu gakuteki chosa). Text in Japanese. In: Annual Report of the Fukuoka Prefecture Center of Hygiene and Environmental Pollution 1 (1973), p. 47-50, 1976.*

A survey was carried out from 1973 to 1975 on 10 forests of major shrines and temples in Fukuoka Prefecture to obtain information on indicator plants. The major plant pollution consisted of Quercus gilua, Castanopsis spp., Pine, and rhododendron. Selected tree species such as Castonopsis spp., Cinnamomum cadphora, cherry trees, and pine trees were studied. Tree vigor was surveyed and classified. The state of epiphtic mosses and lichens, the chlorophyll content and the ratio of chlorophyll a and b were surveyed. It was expected that the smaller the area of the forest, the more severe the environemntal damage would be. However, in some larger forests the effects of air pollution were observed, including the accumulation of soot on the crown, partial necrosis, and untimely leaf-fall on Inex rotunda.

61977 APTIC NO. 83855

EFFECTS OF AIR POLLUTION ON EPIPHYTIC MOSSES AND LICHENS. *(Chakusei sentai chiirui ni oyobosu taiki osen no eikyo). Text in Japanese. In: Annual Report of the Fukuoka Prefecture Center of Hygiene and Environmental Pollution (1973), p. 50-51, 1976.*

The species of epiphytic mosses and lichens, and the percentage of their coverage on the more common trees (such as cherry, cinnamon, and Irex rotunda) were surveyed in Omuta. The results are given on a map. The map was compared to the distribution curves of falling dust. A degree of similarity was observed between the two, although no direct cause-effect relationship could be traced.

61978 APTIC NO. 84688

Miyagi Prefectural Office

A CASE OF PLANT DAMAGE DUE TO CHLORINE DIOXIDE. *(Nisanka enso ni yoru shokubutsu higai jinei). Text in Japanese. In: White Paper of Environmental Pollution, Miyagi Prefectural Office, 1975, p. 71, 1976.*

Agricultural crop damage was discovered on July 2, 1975 in fields near a pulp factory. After inspection the cause of the damage was attributed to chlorine dioxide emission from the factory, a result of mishandling. In normal operation the exhaust from the absorbing tower in which water absorbs chlorine dioxide is 43 ppm (calculated as chlorine). The plant damage by chlorine dioxide consisted of peripheral necrosis of tree leaves and brown spots on vegetable leaves with severe inhibition of growth. Bleached spots were seen in the interveinal parts of leaves of maize. The chlorine content of damaged leaves was between 198 and 530 ppm, as compared to about 50 ppm in healthy leaves.

1975

61979 APTIC NO. 83796

Aihara, K., A. Ishimaru, K. Hirano, M. Kaneko, and S. Nishiyama

INVESTIGATION ON THE COMPONENTS AND COMPOSITION OF THE SMOKE DUCT DUST AND ON ITS BIOLOGICAL EFFECTS PART 2. ESTIMATION OF THE EFFECTS OF THE SMOKE DUCT DUST ON PLANTS BY EXPERIMENTS OF CONTACTING LEAF SURFACES TO THE DUST. *(Endobaijin no seibunsosei to eikyo chosa, Part 2. Yomensesshoku shiken niyoru endobaijin shokubutsu eikyo yosoku). Text in Japanese. Kanagawa Ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent), no. 7:35-36, Dec. 1975.*

A method using an aqueous suspension of dust was found to be simple and relatively accurate for determining the pollutants in the dust, and for reproducing, in the laboratory, visible plant damage very similar to damage in field. Dust collected around a flue which caused leaf damage was an acid smut consisting mainly of sulfuric acid (pH 0.6-1.8 when diluted five times). The rate of visible damage to leaf surfaces brought into contact with the liquid had a close relationship to the pH of the liquid; damage appeared at a pH less than 2.3. The major cause was a strongly acidic material; however, damage was aggravated by the addition of salts, indicated by the electroconductivity. The limiting area visible damage on tomato leaves was found to be the hyperbola connecting pH 2.3 of the liquid and the logarithmic conductivity of 35 ohm/cm (20 C).

61980 APTIC NO. 84241

Aoki, Masanori, Tadashi Ogawa, and Haruhiko Ishikawa

RELATIONSHIP BETWEEN THE TOLERANCE OF TOBACCO PLANT TO SULFUR DIOXIDE AND SILICATE FERTILIZER. *(Tabacco no tai SO 2 sei to keisanshitsu hiryo to no kankei). Text in Japanese. In: Report of the Agricultural Lab. of the Central Research Inst. of the Electric Power Industry (1975), p. 1-19, 1975. 14 refs.*

Symptoms such as chlorosis, reddish-brown spotting, and white spots appeared on the leaves of tobacco plants (MC 1610 and Bel W3 varieties) when exposed to gaseous sulfur dioxide for about 50 days at average concentrations of 0.04, 0.11 and 0.31 ppm. Symptoms of chlorosis were severer as the concentration of sulfur dioxide was higher; the symptoms were less severe where silicate fertilizer (total silica 458 ppm) was used than in a plot where less silicate (total 5 ppm) was used. The relationship between the amount of silicate application and other symptoms was not clear. A decrease in the dry weight of the above-group parts, plant height, the size of the leaves, and the diameter of the main stem was found in MC-1610 variety as the concentration of sulfur dioxide was higher; this phenomenon was not so conspicuous in the Bel-W3 variety. Plants with more silicate fertilization showed less weight-loss and better growth. The total content of sulfur was higher in leaves of plants exposed to higher sulfur dioxide concentrations. The content in plants with more silicate fertilizer was conspicuously lower. A high positive correlation was found between the degree of chlorosis and contents of total sulfur and water-soluble sulfur. Potassium and iron contents of tobacco leaves were higher and calcium content was lower when the plant was exposed to sulfur dioxide at higher concentrations. The opposite phenomenon was observed in tobacco plants fertilized with relatively large amounts of silicate fertilizer.

61981 APTIC NO. 79582

Asakwa, F. and S. Kusaka

ANALYSIS OF LEAFTOP DAMAGE OF WELSH ONION BY USING A CLEAN AIR ROOM. *(Taikijokaho ni yoru negi no hasakigare shogai no kaiseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):465, Nov. 1975.*

The cause of leaf apex damage to welsh onion which occurred recently in summer in southern Hyogo Prefecture and the Seto inland sea coastal region was investigated. Welsh onion, morning glory (Scarlet O Hara), and alfalfa (Dupy) were grown both in a clean air house into which air was introduced via an activated carbon filter, and in an open field. Significantly greater leaf apex damage was observed in open fields and in a

house into which open air was directly introduced, especially on May 21 and June 20 and 28, than appeared in the clean air room. No typical symptom due to sulfur dioxide was observed on alfalfa in the open field. These findings coincided well with the record of air pollution which showed 16 days of oxidant concentrations more than 0.1 ppm, and generally lower concentrations of sulfur dioxide, and with the fact that oxidant and sulfur dioxide in air can be removed by passing the air through a filter with activated carbon. These results confirmed the cause of leaf-apex damage of welsh onion to be oxidant. Typical symptoms due to oxidants appeared on agricultural crops, including welsh onion, 7 days after the oxidant alarm of Aug. 2, 3, 4 and 5.

61982 **APTIC NO. 84010**

Asakawa, F., F. Imai, and S. Kusaka

EFFECTS OF SOIL MOISTURE AND AMBIENT TEMPERATURE ON THE SUSCEPTIBILITY OF WELSH ONION TO OZONE. *(Negi no ozone kanjusei ni oyobosu dojo suibun oyobi ondo no eikyo). Text in Japanese. Japan Soc. Soil Sci. Manure, Annu. Meet., 21st, 1975, p. 147. (April.)*

The effects of soil moisture and ambient temperature on the susceptibility of Welsh onion to ozone were studied. After growing onion plants at 15 C in soil with low P.F. (2.8) and high P.F. (1.8) for one month under controlled conditions in a greenhouse, the plants were exposed to ozone at 0.3 ppm for 4 hr. The growth of onion in low-moisture soil was inferior, especially at high temperature, with poorer growth of roots, and smaller aperture of stomata. Ozone damage was lighter in plants in low-moisture soil, especially at high temperature. The effect of ozone on plants in high-moisture soil was not affected by temperature. Although there was no effect of temperature after exposure on the degree of damage, the whitening and withering of the damaged parts was more rapid. Narrowing the stomatal aperture by phenyl-mercury acetate reduced the ozone damage. The cause of changes of ozone susceptibility was in part the difference in stomatal aperture.

61983 **APTIC NO. 82352**

Baba, T. and S. Sakai

PHYSIOLOGICAL STUDIES ON THE MECHANISM OF OCCURRENCE OF DAMAGE DUE TO AIR POLLUTION ON CROPS. PART IV. ON THE DIFFERENCE OF DAMAGES DUE TO SULFUR DIOXIDE BETWEEN CROP SPECIES. *(Sakumotsu no taiki osen no hassei kiko ni kansuru seiriteki kenkyu. Dai 4 po. Sakumotsu no shurui ni yoru aryusan gasu no higai no sai ni tsuite). Text in Japanese. Preprint, Crop Science Society of Japan, Tokyo, p. 136-137, 1975. (Presented at the Crop Science Society Japan, Annual Meeting, Tokyo, Oct. 16-17, 1975.)*

Potted crops were exposed to sulfur dioxide in a house maintained at spring temperatures. The Eh and pH of the crop tissue juice were determined before and after exposure. A close relationship was observed between the degree of damage to crop leaves and the Eh or pH. A correlation was found between the stomatal aperture and amount of evaporation/unit area of leaf. A positive correlation was found between the degree of leaf damage and the stomatal aperture, and between leaf damage and the degree of stomatal aperture divided by the Eh of the leaf before exposure. The reduction of pH of leaf tissue juice when the leaf was soaked in a dilute sulfuric acid solution (pH of 2.0 or 2.7) was correlated with leaf damage (percentage of the leaf area discolored to white, yellow or brown). These findings seemed to suggest that the formation of sulfuric acid by oxidation of sulfur dioxide causes leaf damage.

61984 **APTIC NO. 80195**

Banasova, Viera and Juraj Hajduk

CONTENT OF CU, ZN, AS AND OTHER ELEMENTS IN SOME PLANTS AND SOILS ON HEAPS AND IN AREAS OF AIR POLLUTION SOURCES. *Text in German. Biologia, 30(4):293-301, 1975. 31 refs.*

Topsoil and plant samples from burrows near ore mines and areas around a copper smelting plant were analyzed for copper, iron, zinc, arsenic, magnesium, and sulfur concentrations. Plants (Silene inflata, Cladonia mitis, Agrostis tenuis, and A. stolonifera ssp. prorepens) growing on burrows contained 0.00242-0.05221% of Cu, 0.08938-0.25445% of Fe, and 0.00407-0.00705% of Zn. The corresponding concentrations of Cu, Fe, and Zn in the upper 6 cm layer of the soil on the burrows were 0.364-1.98%, 1.61-10.56%, and 0.015-0.061%, respectively. Wood samples from Carpinus betulus, and leaves of Carpinus betulus, Dianthus carthusianorum, and Agrostis tenuis contained 0.0001-0.0006% of arsenic, 0.006-0.139% of Zn, 0.001-0.012% of Cu, 0.08-0.17% of sulfur, 0.06-0.34% of magnesium, and 0.37-1.78% of calcium in a forest at 800 m distance from a copper smelting plant. The corresponding As, Zn, Cu, S, Mg, and Ca concentrations in the topsoil around the trees were 0.0151-0.0786%; 0.171-0.262%; 0.112-0.231%; 0.09-0.12%; 0.3-0.67%, and 0.44%. As the concentration of certain elements in plants was higher than in the soil, and higher in plants grown near the emission source than in those grown on the burrows, the air pollutants emitted by the copper smelting plant are responsible chiefly for the accumulation.

61985 **APTIC NO. 82472**

Beauford, W., J. Barber, and A. R. Barringer

HEAVY METAL RELEASE FROM PLANTS INTO THE ATMOSPHERE. *Nature (London), 256(5512):35-37, July 3, 1975. 14 refs.*

The release of heavy metal particles from plants into the atmosphere was investigated using plants labeled with radioactive zinc. Pea plants were exposed to external Zn levels in the range of 0.001-1.0 ppm. The amount of Zn released increased with increasing external levels and was enhanced by illumination. The clearest evidence of Zn release was seen under growing conditions, and required the plants to be fully labelled with radiotracer. The quantity of Zn given off was variable and on several occasions only a small amount of the element was released even though the plants were grown at relatively high Zn levels.

61986 **APTIC NO. 81826**

Blum, S. C. and R. E. Swarbrick

HYDROPONIC GROWTH OF CROPS IN PRESENCE OF 14C-BENZO(A)PYRENE. *Am. Chem. Soc. Div. Petrol. Chem. Preprints, 20(4):869-875, Sept. 1975. (Presented at the American Chemical Society, Division of Petroleum Chemistry, Inc., Symposium on Chemistry, Occurrence, and Measurement of Polynuclear Aromatic Hydrocarbons, Chicago, Ill., Aug. 24-29, 1975.)*

Green beans, cantaloupes, and cotton were grown hydroponically in nutrient-containing aqueous solutions saturated with radiocarbon- labeled benzo(3-4)pyrene to investigate the migration of the carcinogen into plants. Radioassays of plant tissues revealed no evidence of translocation or migration of the polynuclear aromatic hydrocarbon during the growth cycle of the above plants. Contamination found in crops thus requires some other explanation.

61987 **APTIC NO. 76412**

Bonte, Jacques, Louis de Cormis, and Philippe Louguet

INFLUENCE OF POLLUTION WITH SULFUR DIOXIDE ON THE DEGREE OF OPENING OF THE STOMATA IN PELARGONIUM X HORTORIUM. *(Influence d une pollution par le dioxyde de soufre sur le degre d ouverture des stomates du Pelargonium X hortorum). Text in French. C. R. Acad. Sci. (Paris), Ser. D, 280(20):2377-2380, May 1975. 15 refs.*

The effect of 1 ppm of sulfur dioxide on the opening and closing of the stomata in Pelargonium x hortorum was studied. Heterogeneous leaf necrosis was observed after exposure to

SO2. The extent of the necrosis was closely correlated with the initial degree of opening of the stomata. Such lesions were absent or minimal when the diffusion of SO2 into the leaves was hindered by a low degree of initial opening of the stomata. Sulfur dioxide induced a closing reaction of the stomata, but this reaction was absent in most cases when the initial degree of opening was very great. The heterogeneity of the number and surface of the necrotic spots is attributed to the variability in the degrees of opening and in the rates of opening and closing of the stomata. The differences in the sensitivity to SO2 within the same species may be linked with the differences in the stomatic reactions.

61988 **APTIC NO. 80476**

Cameron, James W.

INHERITANCE IN SWEET CORN FOR RESISTANCE TO ACUTE OZONE INJURY. *J. Am. Soc. Hort. Sci., 100(5):577-579, Sept. 1975. 12 refs.*

A high degree of heritability for resistance and susceptibility in sweet corn to acute ozone leaf injury under field conditions was shown during two and three generations of breeding with three series cultivars. Crosses of highly susceptible cross resistant inbreds gave notably susceptible F1 plants. The F2 generation families segregated quantitatively, but extremes were sometimes recovered. The distribution in F2 was skewed toward low injury. Resistant cross resistant crosses gave almost fully resistant F1 s and F 2 s. A study involving a second series of inbreds showed a close relationship between susceptibility in a parent and in its derived F1 s. Three generations of selection and inbreeding, beginning with a segregating population, resulted in near fixation in resistant sublines but showed continued segration in progenies from susceptible selections. (Author abstract modified)

61989 **APTIC NO. 79423**

Craig, Douglas K. and Betty L. Kiepper

THE DESIGN AND CALIBRATION OF A LOW SPEED WINDTUNNEL FOR STUDYING THE FOLIAR DEPOSITION AND UPTAKE OF AEROSOLS. *Am. Ind. Hyg. Assoc. J., 36(9):692-699, Sept. 1975. 6 refs.*

A wind tunnel facility to deliver highly toxic aerosols to the foliage of terrestrial plants under safe and well characterized conditions is described. Flow velocities of 0.1 to 25/cm/sec in the 930 sq cm cross-section experimental area are attainable. The deposition velocity of the material onto the above-ground surfaces of two leaved bean plants having a total area of about 100 sq cm onto the plant is 4.1 times 10 to the -3rd power cm/sec, very nearly the same as that onto smooth, horizontal surfaces under the same flow and aerosol conditions. The distribution of the aerosol over the cross section of the test area is atisfactory. The facility is calibrated using a 198 gold-labelled colloidal aerosol. (Author conclusions modified)

61990 **APTIC NO. 76494**

Curtis, Stanley E., Clyde R. Anderson, Joseph Simon, Aldon H. Jensen, Donald L. Day, and Keith W. Kelley

EFFECTS OF AERIAL AMMONIA, HYDROGEN SULFIDE AND SWINE-HOUSE DUST ON RATE OF GAIN AND RESPIRATORY-TRACT STRUCTURE IN SWINE. *J. Animal Sci., 41(3):735-739, Sept. 1975. 23 refs.*

The effects of aerial ammonia, hydrogen sulfide, and swine house dust on the rate of gain and respiratory tract structure in swine were investigated. Ammonia alone or at 50-75 ppm had little effect of the swine s performance. Only when aerial dust was applied at 300 mg/cu m did it affect performance. At the level more commonly encountered in practice (10 mg/cu m), it had no effect. Effects of aerial dust and NH3 tended to be additive, but they did not interact. Aerial dust did not increase ammonia s assault on the pigs. Hydrogen sulfide, either alone at 8.5 ppm or at 2 ppm in combination with NH3 at 50 ppm had little effect on the growth rate.

61991 **APTIC NO. 76233**

Daly, G. T.

DIAGNOSIS AND ANALYSIS OF AIR POLLUTANT DAMAGE TO PLANTS IN NEW ZEALAND. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975. p. 684-728. 71 refs. (Feb. 17-21.)*

The phytotoxic effects of sulfur dioxide, ozone, gaseous fluorides, photochemical oxidants, nitrogen oxides, and various industrial aerosols are reviewed along with studies in New Zealand involving the use of plants as indicators of air pollution. The distribution of lichen and moss cover on trees, buildings, and soil can be correlated effectively with the pattern of air pollutants at ground level, and the accumulation of pollutants by these plants in an industrial area provides a pollution monitor complementary to that of high volume air sampling or precipitation gauging. Sulfur dioxide and gaseous fluorides (hydrogen fluoride), in particular, exert specific effects on several prominent lichen and moss species. Quantitative examples of field surveys and vegetation sampling in areas exposed to SO2 and fluoride emissions from industrial sources in New Zealand are presented to illustrate how such techniques can be used to help in controlling air pollution. (Author abstract modified)

61992 **APTIC NO. 81599**

Danbayashi, H. and Y. Tanaka

RESULTS OF SURVEY ON PLANT INJURY DUE TO PHOTOCHEMICAL SMOG. *(Kokagaku smog niyoru jumoku higai chosa). Text in Japanese. In: Hyogo Prefecture Forestry Experimental Station 1974. Annual Business Report, p-32, 1975.*

In 1974, a field survey was carried out in 6 places in Hyogo Prefecture where photochemical smog alarms had been frequently issued. The vigor of trees, withering of branches, withering of tree-tops, damage on leaves, leaf-fall, dirtiness of leaves, number of leaves, color of leaves, presence of diseases and pests, height and diameter of trees and tree-bases and the elongation of individual trees were studied. Prunus yedoenis, Celtis sinensis, Ulmus parvifolis, and Quercus serrata were studied. Results of the survey of 21 species showed visible injuries (leaf-fall) on P.y., C.s., U.p., Q.s. and poplar. The content of lead in these leaves is under analysis.

61993 **APTIC NO. 81669**

Danbayashi, H. and Y. Tanaka

SURVEY ON THE DECLINE OF GROVES OF PINUS DENSIFLORA IN THE SUBURBS OF CITIES BY AERIAL INFRARED PHOTOGRAPH. *(Sekigai kuchu shashin ni yoru toshi kinko akamatsu hayashi no suitai chosa). Text in Japanese. In: Annual Business Report 1974, Hyogo Prefecture Forestry Experimental Station, p. 33, 1975.*

An infrared aerial photograph of the effects of air pollution on forest and grove trees in the suburbs of cities in Hyogo Prefecture is described. The results of the survey in 1974 of 9 places in Kobe and 8 places in Himeji are compared to those obtained in Oct. 1972. No difference of tree growth was found between places near and remote from air pollution sources. The index of decline of tree vigor was larger in places nearer to the pollution sources. The sulfur content of leaves was high in Kobe within 12.5 km, and high in Himeji within 15 km, although individual fluctuations of sulfur content were large. The classification of infrared photographs (healthy without decline, moderately healthy, slightly declined and conspicuously declined) showed that the decline of Pinus densiflora was conspicuous within 10 km of air pollution sources in Kobe and 15 km in Himej. It was concluded that P.d. was affected by air pollution within 12.5-15 km of the pollution sources.

61994 **APTIC NO. 80351**

Danbayashi, K. and C. Maeda

ON THE SELECTION AND EXPERIMENTAL GROWING OF RESISTANT TREES AGAINST AIR POLLUTION PART 1. APPARENT RESISTIVITY OF PINUS THUMBERGII. *(Taikiosen ni taisuru jumoku no teikosei kotai senshutsu to ikuseishiken (1). Kuromatsu no mikakejo no teikosei). Text in Japanese. Preprint, Japanese Forestry Society, Kansai Branch, Kyoto, p. 63-66, 1975. (Presented at the Japanese Forestry Society, Kansai Branch, Lecture Meeting, 26th, Hyogo, Oct. 1975.)*

It was confirmed that there are individual trees highly resistant to air pollution within species generally susceptible to air pollution. With the intention of selecting and growing such resistant individuals for planting in air polluted areas, and selecting out and growing highly susceptible individuals for use as plant indicators, both types were selected from groups of Pinus thumbergii in Hyogo Prefecture. A general survey showed that resistant 4 plants had green leaves with strong lustre and susceptible ones had yellowish-green leaves with less lustre. The number of normal leaves was larger on resistant trees than susceptible trees, and the number of leaves with sesame seed-like spots was less in resistant trees than in susceptible trees. The density of foliage was higher in susceptible trees than in resistant trees, and the length of branch was shorter in the latter than in the former. There was a tendency toward greater sulfur content in the leaves of susceptible trees than in resistant trees. It was possible to select for the resistivity of Pinus thumbergii using these criteria.

61995 **APTIC NO. 84081**

Danbayashi, K. and Y. Tanaka

EFFECTS OF AIR POLLUTION ON TREES, AND COUNTERMEASURES PART 4. THE ACTUAL STATE OF WOODS OF PINUS THUNBERGII IN THE SUBURBS. *(Takiosen no jumoku nioyobosu eikyo to sono taisaku Part 4. Toshi kinko kuromatsu bayashi no jittai). Text in Japanese. Hyogo Kenritsu Ringyo Shikenjo Kenkyu Hokoku (Rep. Res. Hyogo Pref. Forestry Exp. Stn.), no. 17:14-37, 1975. 7 refs.*

Effects of air pollution on Pinus thunbergii were investigated at 11 points within 30 km to the NNE of the Himeji Southern coastal industrial zone for 3 years beginning in 1971. A negative correlation was found between the concentration of sulfur oxides in air and the distance from the pollution source, and the pollution has decreased year after year since 1971. The relation between air pollution and tree growth was somewhat apparent in height growth and clearly in diameter growth at chest height at the turning point of 0.3 mg sulfur oxide/100 sq cm/day. No clear relationship was shown between air pollution and tree vigor. The relationship between air pollution and the sulfur content of pine leaves showed individual fluctuation, (in general, a high correlation). When air pollution exceeded 0.5 mg/100 sq cm/day, the sulfur content of the leaves did not increase. These findings indicate that the air pollution due to the Himeji southern coastal industrial zone affected Pinus thunbergii grown 10 km from the pollution source.

61996 **APTIC NO. 82497**

Date, N. and T. Yoneyama

COUNTERMEASURES AGAINST DAMAGE OF SOFT AND WEAK VEGETABLES BY PHOTOCHEMICAL OXIDANT. *(Nanjaku yasai no kokagaku oxidant higai taissaku). Text in Japanese. In: 1974 Tokyo Metropolitan Agricultural Experiment Station Prompt Report, p. 24-25, 1975.*

The problem of vegetable damage due to photochemical oxidant should be solved by regulation of pollutant sources; however, emergency countermeasures were studied. Every species has its appropriate soil pH range, in which damage is relatively small. Between 6-6.5 (Kcl), and at higher electroconductivity (EC) of soil the damage becomes more severe. Therefore, it is preferable to keep soil pH between 6-6.5 and EC lower than 1. Balanced fertilization with nitrogen, phosphorus, and potassium makes the damage lighter, and frequent fertilization with N makes plants stronger. Relatively dry soil makes the damage lighter, as does covering the leaf surface with a 20-times diluted solution of OED green. Plants, especially spinach, grown in vinyl houses early in spring are soft and weak, and therefore especially susceptible to oxidant for some period after removal of the covering.

61997 **APTIC NO. 83732**

Date, N., T. Yoneyama, T. Iijima, K. Terakado, T. Odaira, T. Sawada, and T. Ohashi

TREND OF DISTRIBUTION OF DAMAGE OF HORTICULTURAL CROPS DUE TO PHOTOCHEMICAL SMOG IN TOKYO METROPOLIS. *(Tonai ni okeru engeisakumotsu no kokagaku smog higai bunpu keiko). Text in Japanese. Tokyo-to Nogyo Shikenjo Kenkyu Nenpo (Annu. Rep. Tokyo Met. Agr. Exp. Sta.), vol. 1974:56-57, 1975.*

The results of an investigation of photochemical smog damage in 1973 and 1974, using spinach, taro, maize, and morning glory as indicator plants are described. The damage was recorded as percentages of leaf area damaged, classified as slight (less than 10%) moderate (10-29%) and severe (more than 30%). The results were: (1) Before the rainy season the damage was concentrated in the wards and east of Tama, not westward. After the rainy season, the severe damage frequently invaded the western part. (2) Generally, in center city, the damage was slight; the center was surrounded by areas where damage was severe. (3) Symptoms consisted of ozone and peroxyacetyl nitrate-type damage from spring to early summer, and ozone-type damage in midsummer, with severe symptoms of PAN-type damage in May 1974. (4) The distribution of damage to morning glory showed the same trend as in vegetables. Curiously, in spite of larger cumulative oxidant concentrations in July, 1973, the damage was lighter in the center. (5) Morning glory, spinach, and radish were highly susceptible to ozone; 11 species, including Chinese cabbage, Welsh onion, and taro were moderately susceptible to ozone; chard, lettuce and the cotyledon of kidney bean were susceptible to PAN.

61998 **APTIC NO. 83736**

Date, N., T. Yoneyama, and S. Kurihara

ANALYSIS OF HORTICULTURAL CROP DAMAGE DUE TO PHOTOCHEMICAL SMOG AND THE COUNTERMEASURES. *(Engeishokubutsu no kokagaku smog higai no kaiseki to taisaku ni kansuru kenkyu). Text in Japanese. Tokyo-to Nogyo Shikenjo Kenkyu Nenpo (Annu. Rep. Tokyo Met. Agr. Exp. Sta.), vol. 1974:809, 1975.*

Damage to 22 varieties of vegetable at 67 points in Tokyo was surveyed during May-Aug. 1974. The damage was largely divided into ozone-type and peroxyacetyl nitrate-type. Both types of severe damage were concentrated in the Wards area and the middle part of the North-Tama area, coinciding with the values for oxidant concentrations. In order to select resistant plants and plant indicators for oxidants, 11 kinds of vegetables were grown, and their symptoms and the degree of damage due to oxidants were investigated. Spinach was susceptible to oxidant, the symptoms appearing at 7 pphm (daily maximum/hr), the damage becoming severe at more than 11 pphm. Other vegetables showed similar susceptibility, with the exception of Chinese cabbage (lower) and taro (higher). The spraying of OED could prevent oxidant damage.

61999 **APTIC NO. 84174**

Delcarte, E., J. Tilman, R. Impens, and P. Nangniot

OSCILLOPOLAROGRAPHIC DETERMINATION OF CU, CD, AND ZN IN VEGETABLES IN AN INDUSTRIAL ZONE. *(Determination oscillopolarographique du Cu, du*

Cd et du Zn dans des legumes croissant en zone industrielle). Text in French. Anal. Letters, 8(11):777-785, 1975. 20 refs.

A variety of vegetables was analyzed by oscillopolarography over a three-year period to determine copper, cadmium, and zinc content. The average concentrations for 10 control samples were 27.1 ppm for Cu, 0 41 ppm for Cd, and 38.2 ppm for Zn in the parts exposed to air (leaves and stem), and 53.5 ppm Cu, 0.48 ppm Cd, and 49.1 ppm Zn in the roots. Aside from exceptionally high concentrations of Cu (1904 ppm in tomato leaves) due to a fungicide treatment based on Cu salts, Cu was found in quantities close to those found in control areas. Concentrations of Cd and Zn were higher. They demonstrate the predominant role of metallic dusts. The analysis at regular intervals of vegetables coming from the same garden made it possible to follow the seasonal variations of the pollutant falls. The Cd and Zn concentration variations for washed roots of Raphanus sativus L. and washed and peeled roots of Scorzonera hispanica L., showed the same accumulation process for these metals in the leaves. The concentrations progressively increased in the radish, whereas they rapidly stabilized in the scorzonera. In cooked spinach leaves concentrations were 1.95 ppm Cu, 4.95 ppm Cd, and 161.7 ppm Zn. Only the Cd and Zn concentrations were still high as in cooked Allium porrum L. (0.32, 7.1) Petroselinum cirspum (8.26, 365.8) Daucus carots (0.17, 4.1) and Brassica oleraces L. (0.85, 28.2). Thus an individual eating 250 g of spinach would ingest 0.12 mg Cd and 4.04 mg Zn, given that about 10% of Cd and Zn are resorbed by the organism.

62000 **APTIC NO. 79361**

Favretto, Luciano, Giuliana Pertoldi Marletta, and Luciana Favretto Gabrielli

POLLUTION OF VINEYARDS BY ATMOSPHERIC LEAD. *J. Sci. Food Agr., 26(7):987-992, July 1975. 15 refs.*

Lead accumulation in vineyards exposed to automobile exhaust gases was investigated using three indicator materials: grapes, leaves, and soil sampled at increasing distance from the source. The regression analysis of concentration data on the logarithm of the distance, based on an accepted model, shows that these three materials are suitable for detecting the extent of pollution. Far from the source, where the polluting effect is negligible, the mean typical levels of Pb in these materials are 0.43, 6.7, and 16.2 micrograms/g dry weight respectively. The contribution of the atmospheric Pb to the pollution of plant materials, at various distances from the source, is simply evaluated. The surface contamination is of the same order, but is 20% in grapes and leaves. (Author abstract modified)

62001 **APTIC NO. 84274**

Feldheim, Walter and Wilhelm Stelte

STUDIES ON TEA. I CONTENTS OF MERCURY, LEAD, AND CADMIUM IN TEA LEAVES AND TEA DECOCTIONS. *(Untersuchungen ueber schwarzen Tee. I. Gehalt an Quecksilber, Blei und Cadmium in Teeblaettern und Teeaufguessen). Text in German. Z. Lebensm. Unters. Forsch. (Munich)., 159(5):293-296, 1975. 5 refs.*

Twenty-five teas from different countries were analyzed for toxic trace elements. The concentration of lead was up to 3.08 ppm, of cadmium up to 0.012 ppm, and of mercury up to 3.0 ppm. Concentrations in the tea decoctions were much lower than those for leaves: 0.02 ppm for lead and undetectable for cadmium.

62002 **APTIC NO. 83244**

Fujiwara, T. and T. Umezawa

EFFECTS OF NITROGEN DIOXIDE AND OZONE ON SPINACH. *(Nisanka chisso, ozone no horenso ni taisuru eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):450, Nov. 1975.*

Two varieties of spinach were grown under controlled conditions in a room under a day-light lamp at 20 C for 3 weeks and then exposed to nitrogen dioxide at 1, 10, 15 and 20 ppm, and to ozone at 0.1, 0.15, 0.2 and 0.3 ppm, for 5 hours. The symptoms of damage due to nitrogen dioxide appeared at 20 ppm on the Minsterland variety, at 15 ppm on the Hoyo variety, and those due to ozone appeared at 0.2 ppm and more on both varieties. When Minsterland variety was exposed to mixtures of nitrogen dioxide and sulfur dioxide (0.25 plus 0.25 ppm, and 1.0 plus 1.0 ppm) no damage was observed. When it was exposed to mixtures of ozone and sulfur dioxide (0.25 plus 0.25 ppm), the damage was severer than when it was exposed only to ozone at 0.25 ppm. These cases showed the compound effects. Study of growth inhibition of seed grown spinach exposed to nitrogen dioxide at 0.2-0.3 ppm and ozone at 0.03-0.07 ppm revealed no effect on either variety when evaluated by area and dry weight of the leaves, except for the yellowing of the cotyledon at 0.06-0.07 ppm.

62003 **APTIC NO. 83733**

Fujiwara, Takashi and Takeshi Umezawa

STUDIES ON THE EFFECTS OF COMBINED AIR POLLUTANTS ON PLANTS. PART 2. EFFECTS OF METEOROLOGICAL FACTORS AND OTHER FACTORS ON THE DEVELOPMENT OF PLANT DAMAGE. *(Taiki osenshitsu fukugo no shokubutsu ni oyobosu eikyo ni kansuru kenkyu Part 2, shogai hatsugen ni oyobosu kisho yoin nado no eikyo. Text in Japanese. In: Report of the Agricultural Lab. of the Central Research Inst. of the Electric Power Industry (1975), p. 1-13, 1975.*

The effects of several factors, including meteorological factors, on damage to pea and spinach exposed to a gaseous mixture of sulfur dioxide (0.1 ppm) and ozone (0.2 ppm) for 5 hr were studied. The damage was more severe on plants grown at 20 C for a week before the exposure, than on those grown at 10 and 30 C. The plants grown at reduced illumination (8-9 Klux for 12 hr/day) showed shade leaf phenomena and developed more severe damage when exposed to the gaseous mixture. Plants that had been exposed to lower concentrations of the pollutant (0.05 ppm) one day before the major exposure showed slightly less damage than those without pre-exposure; however, pre-exposure two to three days before had no effect. Rain and fog just before the exposure tended to increase the damage a little. A temperature change of 15-30 C during the exposure did not greatly affect the degree of damage. When ambient relative humidity was 50%, damage was less; over 70% it was greater. Illumination at 26 Klux led to more damage than 8 Klux; there was difference in damage between 26 and 47 Klux. Two combinations of conditions of temperature, moisture, and illumination gave different degrees of damage. Damage was larger at higher concentrations of ozone (0.3 ppm) than at lower concentrations (0.1 ppm). Combined pollutants enlarged the level of damage as meteorological conditions did not.

62004 **APTIC NO. 83799**

Fujiwara, Takashi

STUDIES ON THE DEVELOPMENT OF DAMAGE IN PLANTS CAUSED BY SULFUR DIOXIDE AT LOWER CONCENTRATIONS AND ON THE DIAGNOSES OF THE DAMAGE. *(Tei-nodoiki nisanka io ni yoru shokubutsu no shogai hatsugen to sono shindan ni kansuru kenkyu). Text in Japanese. Noden kenkyusho Shoho, 1975 (Agr. Lab. Cent. Res. Inst., Elec. Power Ind.), no. 74001:1-87, 1975. 109 refs.*

The results of exposing several plants to sulfur dioxide at low concentrations (0.065, 013, and 0.26 ppm) for long periods (14-159 days) were studied. Symptoms and the growth of the plants are described in detail. Plant species were paddy rice, sweet potato, soybean, pea, tomato, eggplant, cucumber, pimento, turnip, radish, Chinese cabbage, lettuce, spinach, grape, pear, tea, and buckwheat. The change of sulfur content of buckwheat continuously exposed to sulfur dioxide at various concentrations is reported. The effects of fertilization with sulfur nitrogen, phosphate, potassium, calcium, and magnesium on the development of symptoms of exposed buckwheat and on the absorption of carbon dioxide were studied. The effects of the exposure of pea and spinach to the mixture of sulfur dioxide (0.1 and 0.2 ppm), nitrogen dioxide (0.1 and 0.2 ppm) and ozone (0.1 and 0.2 ppm) were studied.

62005 **APTIC NO. 76393**

Galimov, E. M.

SHARE OF ANTHROPOGENIC CARBON DIOXIDE IN THE ATMOSPHERIC CARBON DIOXIDE BALANCE. (STUDY OF THE 13C/12C RATIO IN YEAR RINGS OF TREES). *(K voprosu o vklade tekhnogennoy CO2 v balanse uglekisloty atmosfery. (Izuchenie 13C/12C v godichnykh kol tsakh derev ev). Text in Russian. Doklady Akad. nauk SSSR, 225(1):190-191, 1975. 3 refs.*

The 13C/12C ratio was studied in the year rings of two trees growing in an area far from any anthropogenic carbon dioxide emission source by mass-spectrometric method to establish trends in the increase of anthropogenic CO2 in the overall atmospheric balance. The 13C/12C ratios in the years rings of the two different trees showed parallel variations inJependently of possible individual differences in photosynthesis. However, it was impossible to discern any trend in the 13C/12C ratio, where an increase of 12C would indicate the contribution of anthropogenic CO2. The findings indicate that anthropogenic CO2 does not yet have any discernible effect on the overall CO2 balance of the atmosphere.

62006 **APTIC NO. 80189**

Gilbert, O. L.

EFFECTS OF AIR POLLUTION ON LANDSCAPE AND LAND-USE AROUND NORWEGIAN ALUMINUM SMELTERS. *Environ. Pollut., 8(2):113-121, Feb. 1975. 10 refs.*

Investigations around three aluminum smelters in Norway revealed that air pollution emanating from the works was affecting landscape and land-use for a distance of several km. A zonal pattern of damage to the total flora is described in sufficient detail to act as a field guide for the recognition of this type of fume damage. The main reason for believing that the effects described above are caused by air pollution-particularly fluorides-emanating from the aluminum works is that the damage is concentric around the point source and decreases in severity with distance. Furthermore, a careful examination of the total flora revealed that the degree of injury was closely related to the fluoride sensitivity of the species. Widespread damage to lichen communities over approximately the same area in which the more sensitive conifers are affected is reliable confirmatory evidence as these cryptograms are sensitive to air pollution but hardy to extremes of climate. Analysis of plant material collected near the works showed that fluorides were being accumulated to potentially toxic levels in the leaves of damaged plants.

62007 **APTIC NO. 84297**

Hashimoto, S., T. Nakamura, and Y. Ota

ANALYSIS OF DAMAGES OF PLANTS DUE TO AIR POLLUTION BY USING A PURIFIED AIR INTRODUCING ROOM. *(Yukijokaho ni yoru shokubutsu no taikiosen higai no kaiseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):464, Nov. 1975.*

Groups of plants were put into 2 rooms; in one room (A) air was introduced after dust filtering and passing through activated carbon and manganese dioxide (thus containing about 1/4 of the oxidant found in the open air); in another room (B) air was introduced without purification. Oxidant damage symptoms appeared on morning glory and rice plant in room (B) on Aug. 7, 14 and 21; however, no symptom was observed on the same species in room (A). Growth of soybean grown in room (A) was always better than that in room (B) (without any symptoms due to oxidant), and upon havesting, the dry weight of the whole plant and shell weight and raw weight of the 7th leaf were larger in room (A) than in room (B) by 26%, 36% and 20%, respectively. Sulfur content of the plants in room (B) was about 3 times larger than in room (A), suggesting the effective removal of sulfur dioxide in room (A). The yield of soybeans in room (A) was larger (16.9 g) than that in room (B) (8.8 g). Zelkova, Corylopsis spicata, sorbus and platanus grown outside were placed into rooms (A) and (B) on July 31, and after observation, the plants in room (A) turned more beautifully red than those in room (B), with leaf-fall one month earlier in room (B) than that in room (A). The regenerated leaves of ginkgo and zelkova were larger and heavier.

62008 **APTIC NO. 79632**

Hatta, H. and K. Terakado

ON THE CORRELATION OF DAMAGE OF MORNING GLORY AND PETUNIA AND PHOTOCHEMICAL OXIDANT (OZONE AND PAN). *(Kokagaku oxidant (ozone, PAN) to asagao, petunia no higaisokan ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):451, Nov. 1975.*

Seedlings of morning glory (Scarlet O Hara) and petunia (White Ensign and Blue Ensign) were planted in the soil of an environmental exposure room, and 5 degrees of damage to leaves due to naturally occurring smog were measured for different positioning of the plants. The results, obtained in 1974, showed a linear correlation between peroxyacetyl nitrate dose and the degree of damage to two varieties of petunia, with correlation coefficients of 0.8379 (White Ensign) and 0.729 (Blue Ensign). The damage-threshold value of PAN was larger in Blue than White Ensign, with the damage of White Ensign severer than that of Blue Ensign for the same dose of PAN. A dose-response curve for ozone and morning glory showed a straight line with a correlation coefficient of 0.739. By comparing the degrees of damage of two species of plants with doses of ambient ozone and PAN, a measure of the occurrence of ozone and PAN in cases of photochemical smog could be obtained.

62009 **APTIC NO. 83655**

Hatta, H. and K. Terakado

EFFECTS OF AIR POLLUTION ON THE GROWTH AND SEED PRODUCTION OF MORNING GLORY. *(Asagao no seicho to shushiseisan ni taisuru taikiosen no eikyo). Text in Japanese. In: Annual Report of the Tokyo Metropolitan Agricultural Experiment Station (1974), p. 8, 1975.*

The effects of air pollution, especially oxidants on the growth and seed production of morning glory were experimentally studied using a purified air greenhouse and an ordinary greenhouse. Seeds of morning glory, (Scarlet O Hara) were sown in pots, and the pots placed in both greenhouses. The growth of the seedlings was determined every 20 days. Until the middle of July, before oxidants had appeared, no difference in the growth of the plants was seen. Late in July, damaged leaves were noticed in the ordinary greenhouse, with a total dry weight 23% less than that in the purified-air greenhouse. In the middle of August the total dry weight for the plants in the ordinary greenhouse was 41% of that in the purified-air greenhouse. The reduction of weight was conspicuous in the belowground parts. Morning glory (Cherio) was planted separately in both rooms and the seeds were harvested in autumn. The seeds harvested in the purified-air greenhouse totaled 561 shells, 4.61 seeds/shell, 2587 seeds total, 0.049 g/seed. The seeds harvested in the ordinary greenhouse totaled 290 shells, 3.78 seeds/shell, 1097 seeds total, 0.047 g/seed.

62010 **APTIC NO. 83735**

Hatta, H. and K. Terakado

RESULTS OF FIELD SURVEY OF AIR POLLUTION USING MORNING GLORY AS PLANT INDICATOR AND THE PROBLEMS. *(Asagao niyoru taikioawn genchi chosa no kekka to mondai ten). Text in Japanese. Tokyo-to Nogyo Shikenjo Kenkyu Nenpo (Annu. Rep. Tokyo Met. Agr. Exp. Sta.), vol. 1974:11-12, 1975.*

The use of morning glory as an indicator of air pollution was studied in a field survey. Outlines of damage were recorded 5 times in July and 8 times in Aug., attaining a total of 247. The degree of damage was observed at different concentrations of oxidants.

62011 **APTIC NO. 83847**

Hatta, H. and K. Terakado

EFFECTS OF AIR POLLUTION ON THE GROWTH AND LEAF-FALL OF TREES. *(Taikiosen ga jumoku no seicho oyobi rakuyo ni ataeru eikyo). Text in Japanese. Tokyo-to Nogyo Shikenjo Kenkyu Nenpo (Annu. Rep. Tokyo Met. Agr. Exp. Sta.), vol. 1974:54-55, 1975.*

Seedlings of 3 varieties of poplar (OP 226, I 214, and I 45/51), mulberry tree, and Quercus serrata were planted in a cleaned-air greenhouse and in an ambient air greenhouse. The length, diameter, and leaf number of new twigs, the leaf area, and the number of fallen leaves were periodically determined, as was the dry weight of the twigs. The number of leaves, length, diameter, and dry weight of the new twigs were greater in trees in the cleaned-air greenhouse. Those of seeds of eastranopsis were not different in the two rooms. The growth rate of popular was larger in every tree in the cleaned-air room; the difference of growth was due to the difference of the growth increment/leaf. In the ambient air room, the leaf fall of every variety of poplar began in the middle of July, and all the leaves had fallen during early to middle August, while no leaf fall was seen in trees in the cleaned-air room. Comparison leaf fall to cumulative values of oxidant and sulfur dioxide indicated that oxidant affected the leaf fall of poplar. The leaves in the ambient air room showed tarry matter on the surface and a less green coloration.

62012 **APTIC NO. 83721**

Hirai, T. and C. Yamaguchi

DEGENERATION OF FLOWER PIGMENTS DUE TO AIR POLLUTANTS. *(Taikiosen-busshitsu ni yoru hanairo-shikiso no hensei). Text in Japanese. Kinki Daigaku Kogai Kenkyusho Kenkyu Hokoku (Kinki Univ. Pollut. Res. Inst. Rep.), vol. 3:102-110, Oct. 1975. 4 refs.*

Sections of 1 sq cm of flower petals (rose, Chinese bellflower, canna, morning glory, chrysanthemum and sasanqua) were soaked in 0.01 molar aqueous solutions of sodium sulfite, sodium fluoride, and sodium azide for 24 hr at 25 C. The flower pigments were extracted from the intact petals and treated with acidic ethanol and their absorption maxima were determined at 400-600 mn. Paper chromatography was used to separate each pigment, and the components were determined by absorption. Generally, sodium azide caused the most severe damage; the damage showed species specificity. Morning glory was not damaged by sodium azide; canna was not damaged by sodium fluoride; chrysanthemum and sasanqua were not damaged by any of the solutions except sodium azide. Some components of the pigments were damaged by the solutions; some were damaged only by sodium azide. Some pigments in rose petals were very susceptible to the solutions, and some were stable (except for exposure to sodium azide).

62013 **APTIC NO. 83803**

Hirai, T. and T. Tsubota

DEGENERATION OF CHLOROPHYLL IN ROADSIDE TREE LEAVES BY AIR POLLUTANTS. *(Taikiosen busshitsu ni yoru gairoju yo no yoryokuso no hensei). Text in Japanese. Kinki Daigaku Kogai Kenkyusho Kenkyu Hokoku (Kinki Univ. Pollut. Res. Inst. Rep.), vol. 3:111- 118, Oct. 1975. 3 refs.*

Circular discs (10 mm diameter) cut from roadside tree leaves such as Trunus yedoensis, Firmiana platanitolia, Zelkova serrata, platanus, Celtis chinensis, Salix babylonica, Robinia pseudocacia, Cinnamomum camphora, poplar, and Ginkgo biloba were soaked in 0.01-molar aqueous solutions of sodium sulfite, sodium azide, and sodium fluoride and 0.1 molar aqueous solutions of hydrogen peroxide at 25 C for 24 hr under illumination of 3500 lux. Chlorophyll was extracted from treated, untreated, and water-soaked specimens, chlorophyll a and b were measured, and the separation and determination of pheophytine was carried out. Chlorophyll a was more apt to be degraded than chlorophyll b, and the degradation differed by tree species. The percentage of pheophytine formed by the degradation of chlorophyll in total chlorophyll was abnormally high even in untreated platanus and g.b., abnormally high in treated C.c., S.b. R.p., and poplar, and not so high in treated P.y., F.p. and Z.s. These findings can be utilized in evaluating the resistance of trees to air pollution. Another experiment in which year-round changes of the chlorophyll and pheophytine content of leaves of Nerium indicum and poplar were studied supported these findings and the fact that resistance changes with seasons.

62014 **APTIC NO. 82520**

Hiratsuka, T., M. Ito, and K. Tohi

STUDIES CONCERNING THE EFFECTS OF AIR POLLUTANTS ON HORTICULTURAL CROPS. *(Taikiosen busshitsu ga engeisakumotsu nado ni oyobosu eikyo shiken). Text in Japanese. Kanagawa-ken Sangyo Senta Shiken Kenkyu Hokoku (Ann. Rep. Kanagawa Prefect. Sericult. Cent.), no. 3:43-59, July 1975.*

Damage to mulberry leaves in fields in May, Aug., and Nov. was studied with respect to the concentration of air pollutants such as dust fall, sulfur oxides, nitrogen dioxide, chloride ion and fluorine. Laboratory experiments exposing mulberry seedlings to ozone at 0.15 - 0.02 ppm for 20 hr, to ozone at 0.15 - 0.20 ppm for 20 hr and to sulfur dioxide at 1.4 - 1.6 ppm for 14.5 hr, with subsequeit exposures to sulfur dioxide at 1.4 - 1.6 ppm for 14.5 hr at 30 C (daytime) and 23 C (night) were also conducted. The damage to mulberry leaves, represented by their content of sulfur and fluorine, was not so great as last year, except that the fluorine content was a little higher. The results of exposure experiments were: (1) The visable damage was only observed for exposure for 14.5 hr to sulfur dioxide at 1.4 - 1.6 ppm, in contrast to the presumption that the simultaneous exposure to ozone would show a synergistic effect. (2) In spite of lighter visible damage the leaves, the sulfur content of the damaged leaves was larger than that of the leaves which showed heavier visible damage after exposure to sulfur dioxide at 2 ppm for 11 hr in 1971, suggesting that there is no definite relationship between the visible damage and the sulfur content of the leaves.

62015 **APTIC NO. 80125**

Hoffman, G. J., E. V. Maas, and S. L. Rawlins

SALINITY-OZONE INTERACTIVE EFFECTS ON ALFALFA YIELD AND WATER RELATIONS. *J. Environ. Quality, 4(3):326-331, July-Sept. 1975. 16 refs.*

The effect of ozone on forage yield of alfalfa was determined at four controlled salinity levels. Plants were grown in gravel cultures in four environment-controlled, sunlit chambers. Four salinity treatments having osmotic potentials of -40, -200, -400, and -600 kilopascals (kPa) were replicated four times in each chamber. Alfalfa grown in ozone-free chambers was compared with plants exposed to O3 2 hr every day between cuttings. For nonsaline treaments, O3 at 10, 15, and 20 pphm reduced forage yield by 16, 26, and 39% respectively. As salinity increased, O3 had less effect on yield. Alfalfa exposed to 20 pphm of O3 for 2 hr daily yielded 25% more at -200 kPa osmotic potential than at the nonsaline level, -40 kPa. The residual effect of O3 treatments reduced yield in the next

cutting. Salinity at all levels or O3 at 20 pphm increased water use efficiency of alfalfa. Low concentrations of O3 had no effect on water use efficiency. Both O3 and salinity were required to increase leaf diffusion resistance; either factor alone had no effect.

62016 **APTIC NO. 83176**

Ichikawa, N., T. Hasebe, and K. Takao

EFFECTS OF SULFUR DIOXIDE CONTACT ON HIGH CLASS KIDNEY BEAN PLANTS GROWN WITH DIFFERENT AMOUNTS OF SULFUR. *(Dojochu no io ganruo o koto ni shita baai no kokyu ingen (daifuku) ni taisuru aryusan gas sesshoku eikyo). Text in Japanese. Japan Soc. Soil Sci. Manure Hokkaido Branch Meet, 1974-1975, p. 16.*

Kidney beans were grown in potted soil containing added sulfur, from 0-1500 mg with intervals of 250 mg, for 60 days and then exposed to sulfur dioxide at 0.3 + or - 0.04 ppm in a vinyl greenhouse for about 80 hr. The chlorophyll content and the resistance to acids of the leaves were reduced by the exposure. Visible damage to the plants was a little severer in those grown in soils with 750 mg and 1500 mg/pot of added sulfur. The dried weight of the plants was greater when they were grown in soils with up to 750 mg/pot, smaller with sulfur above 750 mg. Exposure to sulfur dioxide reduced the dry weight of the plants. The total sulfur content increased after exposure and with increased sulfur in soil; the largest part was water soluble. The total sulfur increase was larger in leaves than in stems, and larger in upper leaves than in lower leaves. The total sulfur content of the leaves, the ratio of water soluble sulfur to total sulfur, and the ratio of total sulfur in leaves to that in stems should be considered together when judging the history of sulfur dioxide exposure.

62017 **APTIC NO. 79997**

Imai, S., T. Kamada, and S. Sato

ON THE OCCURRENCE OF IODINE-INTOXICATION OF SILK WORMS IN MOBARA AREA, CHIBA PREFECTURE. *(Chiba-ken Mobara chiku ni hassei shita yoso chudoku kaiko ni tsuite). Text in Japanese. Nihon Sanshigaku Zasshi (J. Sericult. Sci. Japan), 44(4):274-280, Aug. 1975. 8 refs.*

Abnormal silk worm growth occurs in the autumn in the Mobara area of Chiba Prefecture. The results of feeding worms on mulberry leaves collected around 2 factories manufacturing respectively iodine and molybdenum showed that the abnormal growth of silk worms was due to the intake of iodine on mulberry leaves. The iodine content of leaves of the mulberry trees was as high as 110 ppm. The iodine content of silk worms fed with the polluted leaves for 7 - 8 days at 100 ppm reached 80 ppm, resulting in the gradual death of the worms. The content of iodine of the leaves could not be reduced by water-washing. The development of the disease is described in detail.

62018 **APTIC NO. 84685**

Imai, S. and S. Yoshii

TOXICITY TO SILKWORMS OF SEVERAL POLLUTANTS DETECTED IN THE MULBERRY LEAVES GROWN IN MOBARA AREA, CHIBA PREFECTURE. *(Chibaken mobara chiku no kuwa-ha kara kenshutsu sareta sushi osen busshitsu no kaiko ni taisuru dokusei). Text in Japanese. Nihon Sanshigaku Zasshi (J. Sericult. Sci. Japan), 44(6):440-443, 1975. 11 refs.*

Because of the possibility of other pollutants than iodine in the exhaust of an iodine factory and a molybdenum factory in the Mobara area of Chiba Prefecture, the mulberry leaves in seemingly highly polluted orchards located at the south and southwest were collected and analyzed. Although the content of sulfur and molybdenum was proportionally smaller as distance from the factory group increased, that of total fluorine and total chlorine was constant, notwithstanding distance from the factory. The iodine content showed the same tendency as sulfur; however, the smallest content was still higher than a control group. When silkworms were reared with an artificial diet containing sulfute and 1000 ppm of molybdenum powder, molybdenum sulfite, molybdenum oxide, molybdenum acid, sodium molybdate, potassium molybdate, and (NH4)6Mo7024, no abnormality was observed on the silkworms except a slight delay of growth. From these findings, it was concluded that no pollutant was toxic by itself, but toxic in combination.

62019 **APTIC NO. 83545**

Inoue, E.

STUDIES ON THE EFFECT OF AIR POLLUTION TO THE ARBOREAL PHYSIOLOGY PART 1. SUBPART 1. RESULTS OF INVESTIGATION ON THE CONTENT OF WATER SOLUBLE SULFUR IN LEAVES OF PINCUS DENSIFLORA 2. RESULTS OF FIELD PLANTATION OF PINUS GENERA 3. RESULTS OF FIELD PLANTATION OF GREEN TREES FOR SHADE. *(Taikiosen no jumokuseiri ni oyobosu eikyo ni kansuru kenkyu 1. 1. Akamatsu shinyochu no suiyosei io ganyuryo no chosa 2. Matsuzoku genchi shokusai shiken 3. Ryokkaju genchi shokusai shiken). Text in Japanese. Okayama-ken Ringyo Shikenjo Hokoku (Bull. Okayama Prefect. For. Exp. Stn.), no. 15:95-101, Oct. 1975.*

New leaves of Pinus densiflora collected in Sept. 1974 in an industrial area of Mizushima that was polluted by sulfur oxides were analyzed for water soluble sulfur. The total sulfur content of the leaves and the water soluble sulfur content were 1.08-1.88 mg/g and 0.51-1.28 mg/g, respectively, the latter being more than 50%; the figures for a non-polluted area were 1.05 mg/g and 0.36 mg/g, the latter being about 30%, showing that the water soluble sulfur content of an air polluted area may be 1.5-3.7 times that of a non-polluted area. In a second study, six species of pine were planted in an area polluted by sulfur dioxide in Feb. 1968. At the end of 1974, it was shown that slush pines and teda pines were superior in growth to other pines. Several species of trees were planted in gardens with different degrees of air pollution in 1971, 1972, and 1973, and their growth was investigated. The effect of air pollution could not be observed.

62020 **APTIC NO. 84628**

Ishibashi, Ryugo, Yasuaki Sugi, and Hisamasa Kifuji

ON MOSSES HEAVY METAL AMOUNT AS AN ENVIRONMENTAL INDICATOR. *(Kankyo shihyo to shiteno senruichu no jukinzokuryo ni tsuite). Text in Japanese. Preprint, Japan Society of Public Health, Tokyo, p. 514, 1975. (Presented at the Japan Society of Public Health, Lecture Meeting 34th, Yokohama, Oct. 1975, Paper 754.)*

The heavy metals content in mosses growing on trees was studied in order to establish an environmental index. The metals analyzed were cadmium, lead, zinc, copper, iron, and manganese. Levels were determined by atomic absorption spectrometry after sample mosses were ashed and treated with nitric acid. The mosses were collected from 21 locations surrounding a zinc smelting factory in Omuta City. Samples were collected from locations near the factory as well as from locations remote from the factory for comparison. The average cadmium level found near the factory was 3.9 ppm, while that of the remote locations was 0.9 ppm. The highest cadmium level found was 8.8 ppm which was from the sampling locations closest to the factory. A distribution of cadmium levels according to distance from the factory was observed. The average zinc level found near the factory was 329 ppm with a maximum of 684 ppm, while that of the remote area was 160 ppm. The distribution of zinc was similar to that of cadmium. The correlation factor for the cadmium and zinc levels was 0.9886. The average lead level found near the factory was 56 ppm, while that found at the remote place was 21 ppm. The distribution of the lead levels differed from that of cadmium

or zinc, indicating the effect of lead emitted from automobile exhaust gases.

62021 APTIC NO. 80052

Ito, S.

HISTOLOGICAL RESPONSES OF NEEDLES OF PINUS DENSIFLORA EXPOSED TO GASEOUS SULFUR DIOXIDE. *(Aryusan gasu ni taisuru akamatsu shinyo no soshikigaku teki na hanno). Text in Japanese. Nihon Ringaku Kaishi (J. Japan. For. Soc.), 57(9):300-304, Sept. 1975. 14 refs.*

Differences in the response to sulfur dioxide of several tissues in newly grown needles of Pinus densiflora were studied by exposing 2nd year seedlings of the tree to gaseous sulfur dioxide at 2 ppm for 12 hours. Before visual damage appeared on the needles, plasmolysis was observed in the mesophyllar cells around the stomata. As the exposure went on, the needles showed acute symptoms with necrosis of the mesophyllar cells developing linearly into the endodermis, followed by deformation of endodermic cells and the cells of transfusion tissue. This damage, however, was limited to a part of the mesophyll and did not develop in other sections of the mesophyll. After 9 hours of exposure, necrosis was observed in almost all the mesophyllar cells. After 12 hours of exposure, smoky spots covered the full length of the needle; however, cells of the epidermis, the hypodermis, the resin canal and the xylem showed no abnormality, and cells in the phloem showed abnormality only occasionally.

62022 APTIC NO. 76396

Jenkins, Catherine

USE OF COLUMBA LIVIA GM AS AN INDICATOR OF AIR POLLUTION DUE TO LEAD. *(Utilisation du Pigeon Biset (Columba livia Gm.) comme temoin de la pollution atmospherique par le plomb). Text in French. C. R. Acad. Sci. (Paris), Ser. D, 281(16):1187-1189, Oct. 1975. 8 refs.*

The lead concentrations in different organs of Columba livia Gm. living in different districts of Paris were measured to establish relationships between the lead levels and the automotive exhaust lead concentrations in the air, estimated on the basis of actually measured carbon monoxide concentrations. The blood level, slightly higher in males than in females, proved not to be a reliable indicator of lead poisoning, while the lead concentrations in the bones, consistently higher in females males, and accounting for about 90% of the total lead retained, and that in lungs were found to be true indicators of the lead concentrations in the air. Correlations with factors of +0.81 and +0.85 were established between the atmospheric lead concentrations and the lead levels in the lungs and bones, respectively. The lead levels in the bones and lungs, varying within Paris as a function of the concentrations in the air, were significantly lower in control animals from a non-polluted area. The findings indicate that the lead levels in the bones and lungs of C. livia Gm. can be used as reliable indicators of air pollution due to exhaust lead.

62023 APTIC NO. 79785

Jensen, Keith F. and Roberta G. Masters

GROWTH OF SIX WOODY SPECIES FUMIGATED WITH OZONE. *Plant Disease Reptr.), 59(9):760-762, Sept. 1975. 5 refs.*

White birch, yellow birch, bigtooth aspen, eastern cottonwood, Japanese larch, and white spruce seedlings were fumigated with 25 pphm ozone for 110 days. Height growth of the white birch seedlings was reduced, but not by a significant amount; growth of the other species was not affected. The number and size of the white birch leaves were also reduced during the fumigation period. (Author abstract)

62024 APTIC NO. 80122

Jensen, K. F. and T. T. Kozlowski

ABSORPTION AND TRANSLOCATION OF SULFUR DIOXIDE BY SEEDLINGS OF FOUR FOREST TREE SPECIES. *J. Environ. Quality, 4(3):379-382, July-Sept. 1975. 16 refs.*

Rates of absorption of sulfur dioxide and of translocation of absorbed sulfur were determined in sugar maple, bigtooth aspen, white ash, and yellow birch seedlings. Bigtooth aspen had the highest absorption rate with no prefumigation and sugar maple had the lowest. After 20 hr or more of prefumigation with 1965 micrograms/cu m (0.75 ppm) SO2, the rate of sulfur absorption was reduced in all species except white ash. The relationship between species sensitivity and absorption rate thus changed with the prefumigation treatment. The foliar sulfur content of all species increased with SO2 fumigation. Sulfur-35 absorbed from the atmosphere as 35SO2 was concentrated mainly in the leaves shortly after fumigation, but by the eighth day was translocated throughout the plants. Amounts of sulfur translocated to roots varied with species. (Author abstract modified)

62025 APTIC NO. 83247

Kakutani, N., S. Ochiai, J. Yoshida, and M. Maeno

ON THE SURVEY ON THE MECHANISM OF PHOTOCHEMICAL DAMAGE USING MORNING GLORY AS PLANT INDICATOR. *(Asagao o shihyo to suru kokagaku kogai no hasseikiko chosa). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):452, Nov. 1975.*

Damage to morning glory (Scarlet O Hara) due to photochemical smog was investigated from June 1 to July 31, 1975 in Kanagawa Prefecture. Injury to morning glory was severer before and after June 26, July 10, July 26 and June 24, and photochemical smog occurrence corresponded well to the occurrence of injury. During days when much general plant damage occurred, daily highest oxidant concentrations were more than 8 pphm; concentrations from 0900 to 1800 was more than 50 pphm/hour. Damage appeared in the middle and at the end of June just after the occurrence of oxidant concentrations of more than 60 pphm/hour; and in the middle and end of July after occurrence of concentrations of 50 pphm/hour. In spite of the occurrence of photooxidant far higher than 50 pphm, the later cases were not so severe, suggesting a difference of sensitivity of the plants to photochemical oxidant in their growing stage. The cumulative percentage of damaged leaves was larger in the middle and the western parts of the Prefecture.

62026 APTIC NO. 83731

Kamihira, Matsuo, Masanori Aoki, Tadashi Ogawa, and Yoshikazu Minohara

ON THE TOLERANCE OF FRUIT-VEGETABLES TO SALTY AIR. *(House kasairui no kichu enbun ni taisuru tai-ensei ni tsuite). Text in Japanese. In: Report of the Agricultural Lab. of the Central Research Inst. of the Electric Power Industry, (1975), p. 1-14, 1975. 9 refs.*

A case of crops exposed to salty air in a greenhouse in which heated sea water was utilized for warming led to a study of the effects of salty air on vegetable fruit crops such as pimento, cucumber, tomato, and eggplant. The plants were exposed to air containing 4.75 mg sodium chloride/cu m. The effects of sodium chloride deposited on the plants were studied as well as the effects of sodium chloride sprayed on the plants. The degree of damage to the plants due to salty air increased nearly linearly as the chlorine content of the leaves of the plants increased. The critical chlorine content of leaves, at which damage began to appear was 1.0% in tomato (dry material) and cucumber, 1.2% in pimento, and 2.0% in cucumber. When the degree of leaf damage reached 25%, the chlorine content of leaves was 1.5% in tomato, 2.0% in cucumber, 3.7% in pimento, and 4.7% in eggplant. The tolerance

of vegetable fruit crops to salty air was in decreasing order of pimento, tomato, cucumber, and eggplant. The chlorine content at several conditions of salty air was higher in eggplant than in pimento. The permeation of the salt from the surface of leaves into the plant body was higher at higher relative humidity (90%) than at lower humidity (50%) in the greenhouse.

62027 **APTIC NO. 80082**

Kokubu, Y.

RESULTS OF ACTUAL STATUS OF PEST INSECTS AND DISEASES ON GREENING TREES IN SOUTHERN PART OF HYOGO PREFECTURE, HAVING THE RELATIONSHIP TO AIR POLLUTION AS A FOCUS. *(Honken nanbu-chiiki ni okeru ryokukajumoku no byoghugai jittai chosa). Text in Japanese. Hyogo Pref. Forestry Exp. Stn., no 16:28-73, 1975.*

Pest insects and diseases on greening trees in an urban area of southern Hyogo Prefecture are discussed with respect to air pollution and the indicator properties of pest insects and tree diseases. Ninety-five plant species in parks and schools in the cities of Amagasaki, Takarazuka, Kobe, and Himeji were studied. Ninety-three pest insects and 20 kinds of plant disease were recognized. Although no disease was found only in polluted areas, the frequency of occurrence and the damage due to Canephorae were higher in air polluted areas.

62028 **APTIC NO. 79631**

Matsushima, F., T. Odaira, T. Sawada, and I. Nouchi

EFFECTS OF OZONE, ETHYLENE, NITROGEN DIOXIDE AND SULFUR DIOXIDE ON THE MICROSTRUCTURE OF LEAVES OF ZELKOVA SERRATA. *(Keyaki no ha no bisaikozo ni oyobosu ozone, ethylene, nitrogen dioxide, sulfur dioxide no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):454, Nov. 1975. 1 ref.*

Potted trees (Zelkova serrata, 3 years old) were exposed in 4 groups to ozone at 0.2 ppm, ethylene at 0.5 ppm, nitrogen dioxide at 3.0 ppm, and sulfur dioxide at 1.2 ppm for 8 hr/day, for 8 consecutive days; after exposure the leaves were fixed for microscopic examination. No visible injury or leaf-fall was seen on the exposed plants except for some smoky spots on those exposed to sulfur dioxide; the leaf parts without the spots were examined. In leaf cells of the ozone group, disorder of intergranallamella was found with degeneration of ribosome and micro-vacuolation of cytoplasma without cutting of lamella and change of mitochondria. In leaf cells of the ethylene group, conspicuous increase and enlargement of osmiumphilic granulets was characteristic, with microvacuolation of cytoplasma. In leaf cells of the nitrogen dioxide group, disorder of intergranal lamellar structure with cutting and dissolvation of lamella was observed. The leaf cells of the sulfur dioxide group clearly showed severe plasmolysis with destructed ribosome and cytoplasma, without severe destruction of lamellar structure.

62029 **APTIC NO. 84013**

Mayumi, Y. and F. Yamazoe

STUDIES ON THE PREVENTION OF COMBINED AIR POLLUTION PART 2. ON THE COMBINED ACTION OF OZONE AND SULFUR DIOXIDE. *Taikifukugo-osenboshi ni kansuru kenkyu. Dai-2-ho. Ozone oyobi nisankaio no Fukugo sayo ni tsuite). Text in Japanese. Japan Soc. Soil Sci. Manure, Annu. Meet., 21st, 1975, p. 146. (April.)*

Potted orchard grass, maize, and Chinese cabbage were exposed to ozone, sulfur dioxide, and a mixture of the two, at 0.1-0.5 ppm, 25 C, and RH 60-70% for 4-8.5 hr with a wind velocity of 0.7 m/sec and natural light. By determination of the leaf damage and of the sulfur content of exposed plants, it was found that the susceptibility of the plants to both gases changed in a day, and that while there was a difference of leaf damage according to the strength of light after exposure to sulfur dioxide, the difference was due to the strength of light during exposure to ozone. No relationship was observed between the amount of sulfur absorbed and the changes of susceptibility that occurred in one day. When calcium carbonate was added to soil, there was no prevention of damage when the exposure to gases occurred at 0830, but such an effect was observed in exposures after 1100, especially on Chinese cabbage. Damage due to the gaseous mixture was more severe than for each gas alone, suggesting synergistic action.

62030 **APTIC NO. 76328**

Menser, H. A. and J. F. Chaplin

EFFECTS OF OZONE AIR POLLUTION ON NITROGEN CONSTITUENTS, PH, AND WATER SOLUBLE ASH OF AIR CURED TOBACCO LEAVES. *Tobacco, vol. 1975:70-73, Sept. 19, 1975. 14 refs.*

The effects of 1 ppm ozone air pollution on nitrogen constituents, pH, and water soluble ash of air cured tobacco leaves were investigated. Total alkaloids expressed as nicotine are lower in severely damaged leaves than in lightly damaged leaves. Ozone damage increases the protein nitrogen content but decreases the levels of nitrate and soluble total nitrogen in all cultivars. Leaves grown in carbon filtered air contain more alkaloids than oxidant damaged leaves. Ozone fumigations that inflict extensive damage to older leaves cause decreases in nicotine and water soluble ash and increases in total nitrogen and the pH of leaf extract. (Author abstract modified)

62031 **APTIC NO. 82519**

Miyamoto, Y.

ANIMAL PHENOLOGY AS AN INDICATOR OF ENVIRONMENTAL POLLUTION-- DISTRIBUTION OF ENVIRONMENTAL POLLUTION IN JAPAN SEEN FROM FREQUENCY OF OBSERVATION. *(Kankyo osen no shihyo to siteno dobutsu kisetsu. Kansokuritsu kara mita nihon no osen bunpu). Text in Japanese. Tokyo Kanku Chiho Kisho Kenkyukai-shi (Geophys. Notes Tokyo Dist. Meteorol. Obs.), no. 8:27-29, Sept. 1975. 3 refs.*

Observations were made from 1953 to 1972 of the populations of 4 species of bird, 1 species of amphibian, and 6 species of insect to determine their use as indicators of environmental pollution. The averaged total frequency of observation throughout Japan dropped from 80% in 1955 to less than 60% late in 1960s; however, in the 1970s it showed a tendency toward recovery. By species, the frequency changed less for butterfly and cicada than for lark, firefly and frog. Especially noticed was the severe drop of the frequencies in urbanized zones such as Tokyo - Yokohama and Osaka (as low as less than 30%). When frequency by type in Japanese cities was divided into 5 classes, and a distribution map of Japan was drawn, it was shown that there is a close connection between the frequency of observation of animal species and the degree of environmental pollution.

62032 **APTIC NO. 76626**

Moore, Peter D.

EVOLUTION OF TOLERANCE TO POLLUTION. *Nature (London), 258(5530):13-14, Nov. 6, 1975. 10 refs.*

Studies on the tolerance of plant species to sulfur dioxide are summarized. Prolonged exposure to low concentrations of SO2 (below 15 pphm) does not harm most plants although depressed yield in ryegrass variety S23 (Lolium perenne) is reported. Sulfur dioxide pollution places a stress upon plant species and selects against those individuals in a population which are least tolerant. There are statistically significant differences in Geranium carolinianum between the mean leaf area damaged in population near to and far from the source of SO2 pollution. Differences are generally of the order of 10% less damage to the populations found close to the source (electric power station).

EFFECTS-PLANTS AND LIVESTOCK

62033 **APTIC NO. 84011**

Morikawa, M., Y. Mtsuoka, T. Takasaki, and T. Shiratori

STATE OF OCCURRENCE OF PADDY RICE VISIBLE DAMAGE DUE TO OZONE BY GROWING STAGES. *(Suito no ozone kashigaicho no sei- ikujikibetsu hatsugen jokyo). Text in Japanese. Japan Soc. Soil Sci. Manure, Annu. 21st, 1975, p. 147. (April.)*

Experiments on the changes of susceptibility of paddy rice to photochemical oxidant at different growing stages are described. Rice plants in a series of growing stages from 2-leaf to dough were exposed to ozone at 0.1 ppm for 3 hr, 3 times in June, July and Aug. A survey of visible symptoms was carried out. Exposed plants showed nearly the same visible symptoms as those damaged in fields by photochemical oxidant: an appearance resembling stifle disease on the second to third leaf blade. The susceptibility of plants in the seedling bed stage became higher as growth proceeded. In the paddy-field stage, the susceptibility was highest in the early fillering stage; almost no visible symptoms appeared after the ear premordia stage. Because of earlier rice growing procedures in Chiba Prefecture, the susceptibility of the rice plants to oxidant in July and Aug. is especially low, due to their being in the ear premodia stage, and so damage due to oxidant is not frequent.

62034 **APTIC NO. 80477**

Murray, J. J., R. K. Howell, and A. C. Wilton

DIFFERENTIAL RESPONSE OF SEVENTEEN POA PRATENSIS CULTIVARS TO OZONE AND SULFUR DIOXIDE. *Plant Disease Reptr., 59(10): 852-854, Oct. 1975. 8 refs.*

Seventeen Kentucky bluegrass (Poa pratensis) cultivars were exposed to either 40 pphm ozone or 20 pphm sulfur dioxide for 2 hr at 26 C, 92% relative humidity, and an illumination of 21,520 lux. The range in sensitivity among the cultivars was not so great for SO2 as for O3. Cultivar response differences to both O3 and SO2 injury were not sufficiently consistent to indicate genetic differences within this species. Several cultivars had practical levels of resistance. A differential response among cultivars was generally obtained with the two pollutants. (Author abstract modified)

62035 **APTIC NO. 83250**

Nakada, M., S. Fukui, and S. Sugano

STUDIES ON THE EFFECTS OF AIR POLLUTANTS ON THE ELONGATION OF POLLEN TUBES. *(Yugaibusshitsu no kafunkan no shincho ni oyobosu eikyo no kenkyu). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.), no. 7:32, Dec. 1975.*

Pollens of lily flowers were exposed to sulfur dioxide, nitrogen dioxide, ozone, formaldehyde and acrolein, and to mixtures of these gases to find the relationship between the kind and concentration of the gas and the degree of pollen tube elongation, as an indicator of air pollution. Although sulfur dioxide and acrolein inhibited the elongation at relatively lower concentrations, ozone did not inhibit at lower concentrations. The mixtures of sulfur dioxide and nitrogen dioxide, ozone and nitrogen dioxide, and nitrogen dioxide and formaldehyde showed conspicuous synergistic inhibitory action. The synergistic action of ozone was especially remarkable.

62036 **APTIC NO. 79629**

Nakagawa, Y., I. Mitsuki, and T. Takaoka

RESPONSE OF PLANTS TO AIR POLLUTION BY HEAVY METALS. *(Jukinzoku ni yoru taikiosen to shokubutsu no hanno). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):456, Nov. 1975.*

The contents of heavy metals in leaves of Firmicana platanifolia grown within 4 km of an iron foundry was evaluated. The major pollutants in dust from the foundry were iron and manganese (34.6-57.8% and 0.41-3.21%, respectively), mainly oxides, amounting to 395 and 4 tons/year, respectively. Iron was transferred from air to soil then to the plants via roots. Manganese in soil decreased exponentially as a function of distance from the foundry; however, Mn in the leaves showed a tendency to increase as the distance increased.

62037 **APTIC NO. 83718**

Nakagawa, Y., I. Mitsuki, and T. Takada

REACTIONS OF ENVIRONMENTAL POLLUTION BY HEAVY METALS WITH PLANTS PART 1. MAINLY, ON THE INTAKE OF IRON AND MANGANESE INTO PLANTS. *(Jukinzoku osen to shokubutsu no hanno 1. Shutoshite tetsu, mangan no shokubutsu e no torikomi ni tsuite). Text in Japanese. Hyogo-ken Kogai Kenkyusho Kenkyu Hokoku (Rept. Public Nuisance Res. Inst., Hyogo Prefect.), vol. 1975:13-21, 1975. 7 refs.*

The intake and accumulation of iron and manganese from polluted air into the leaves of Firmiana platamifolia grown around an iron foundry was measured. The floating dusty material and its content of iron and manganese decreased exponentially with increased distance from the foundry. The ratio of the expected amount of iron to the nitric acid soluble iron in the floating dust was similar to that of the dust of the foundry. The content of iron in the leaves of F. p. and in the soil decreased exponentially as the distance from the foundry increased. There was a high correlation between the content of iron in the leaves and in the soil. These findings suggest that the route of absorption and accumulation of iron dust exhausted from the foundry is from air to soil to absorption via roots to the leaves. While the content of manganese in the soil decreased exponentially as distance from the foundry increased, that in the leaves increased exponentially with distance from the foundry.

62038 **APTIC NO. 82441**

Nakajima, S. and T. Oshima

INVESTIGATION OF URBAN ENVIRONMENT FROM PHOTOGRAPHIC INFORMATION (PHOTOSURVEY) PART 2. SURVEY OF CHANGE OF GREENNESS. *(Shashinjoho (shashinsokuryo)) niyoru toshi kankyo chosa, 2 midori no henka ni tsuite no chosa). Text in Japanese. Shibaura Kogyo Daigaku Kenkyu Hokoku (Res. Rep. Shibaura Inst. Tech.), no. 19:248-259, 1975. 18 refs.*

Changes in vegetation in Tokyo since 1963 are described. Ten sections in an 800 ha area of Suginami Ward were surveyed. The percentage of green-covered areas in these 10 sections changed from 1963 to 1972 as follows: 40-29, 38-31, 32-29, 39-30, 37-23, 38-24, 23-15, 39-29, 45-32 and 33-23. A continued decrease of greenness in the near future is expected. Future plans for preserving the environment are discussed.

62039 **APTIC NO. 83734**

Nakajima, T., K. Terakado, A. Yanagida, and H. Hatta

EFFECTS OF AIR POLLUTION ON THE GROWTH OF RICE PLANT AND CROP YIELD. *(Suito no seiiku shuryo ni oyobosu taikiosen no eikyo). Text in Japanese. Tokyo-to Nogyo Shikenjo Kenkyu Nenpo (Annu. Rep. Tokyo Met. Agr. Exp. Sta.), vol. 1974:58-59, 1975.*

Groups of rice seedlings were transplanted into pots. Some were grown through the season in cleaned air. Some were grown in cleaned air during the first half of the season, and then exposed to polluted ambient air. Some were grown in clean air and then exposed to polluted air after the appearance of grains. Some were grown through the season in polluted air (variety Tosan 38). Growth inhibition was seen. Delays in earing and maturation for 2-3 days, with slight dwarfing but without reduction of the number of ears was seen. Smaller grains, reduction of the weight of 1000 grains, and increased numbers of incomplete grains showing insufficient ripening were seen. Plants in group 3 seemed not to be affected by polluted air. The growth of plants in group 2 was between that of 1 and 4.

62040 **APTIC NO. 84551**

Nakajima, Y.

RESULTS OF DETERMINING FLUORINE CONTENTS OF AGRICULTURAL CROPS. *(Nosakubutsu no fusso ganyuryo choya). Text in Japanese. In: Fourth Prefectural Report on the Results of Survey on Air Pollution in the Naoetsu Area. Niigata Prefectural Office (Japan), p. 76-85, Aug. 1975.*

Fluorine contents of agricultural crops collected around an aluminum refinery in the Naoetsu area were analyzed by the distance from the refinery, the type of crops, and the season. By comparing the plant contents with the environmental concentration (LTP method) the actual state of pollution was determined with the intention of finding indicator plants and determining the inhabitants intake of fluorine. At first, equiconcentration curves of fluorine content of air with more than 100, more than 50, more than 20, and less than 20 micrograms/sq dm LTP/mo were drawn on the map. The value in the predominant wind direction was about 20 micrograms at a distance from the refinery of 4 km. The fluorine content was higher in leaf-vegetables, fruit-vegetables, and polished rice than in respective controls. Root-vegetables contained lower amounts of fluorine. According to distance from the refinery without regard to wind direction, a trend of reduction of fluorine content was found; however, it was not significant in all vegetables except for polished rice, leaves of Japanese radish and eggplant. By distance, in the predominant wind direction, the content of fluorine showed negative correlation to the distance from the refinery in polished rice, leaves of potato, spinach, Japanese radish and eggplant. There was a significant correlation between environmental air concentration and the content of fluorine. One sample of Chinese cabbage contained fluorine as high as 10 ppm. Spinach was considered to be appropriate as an indicator of fluorine in air, because it gave a correlation between fluorine content and distance, fluorine content and wind direction from the refinery, and fluorine content environmental concentration of fluorine.

62041 **APTIC NO. 84553**

Nakajima, Y.

RESULTS OF SURVEY ON PLANT DAMAGE DUE TO FLUORIDE. *(Fukkabutsu ni yoru shokubutsu higai chosa). Text in Japanese. In: Fourth Prefectural Report on the Result of Survey on Air Pollution in the Naoetsu Area. Niigata Prefectural Office (Japan), p. 86-113, Aug. 1975. 9 refs.*

In order to elucidate the relationship between environmental fluorine concentration and the fluorine content of agricultural crops and that between visible injuries of crops and crop yield, potted plants of spinach and Welsh onion (both in spring and autumn) and gladiolus were put in locations 200, 500, 1000, 1500 and 2500 in. from an aluminum refinery and their growth and the degree of injury (damaged leaf area of spinach and leaf withering of Welsh onion and gladiolus) was surveyed as well as the fluorine content. Rice plants planted around the refinery were also similarly investigated. The injury to spinach due to fluoride in air appeared in both seasons as shortness, shrunken and whitened leaves, and low yield and growth, especially in places within 1 km of the refinery. Welsh onion was damaged by downy mildew. Gladiolus plants within 1 km of the refinery showed were withered up to the VI leaves. There were high correlations between the fluorine content of crops and fluorine concentration in the air (LTP value), between the degree of injury and fluorine content of crops, and between the degree of injury and fluorine content in air (LTP value).

62042 **APTIC NO. 79630**

Nakamura, H.

STUDIES ON THE INDICATOR PLANT FOR MONITORING AIR POLLUTION PART II. INDICATING PROPERTIES OF RICE PLANT TO PHOTOCHEMICAL OXIDANT. *(Taikiosen kanshiyo shihyoshokubutsu ni kansuru kenkyu Part II. Kokagaku oxidant ni taisuru ine no shihyosei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):455, Nov. 1975.*

The specific symptoms of rice plant damage by photochemical oxidant include minute spots, brown or whitish yellow in color, appearing on leaf blades of completely developed second position. Brown spots indicate severer damage than whitish yellow spots. The most susceptible stage of rice plant development was the 3 to 10 leaf stage; accordingly, the damage in actual fields is seen between May and July. Damage is liekly to appear when the plants are grown in dry land. The cultivating condition for rice plant that is most closely related to its susceptibility to photochemical oxidant is nitrogen fertilization. Fertilizer containing N, phosphorus, potassium (8-8-5) given at 5g/pot rendered plants most susceptible (for over 12g/pot, the damage was less). Clear difference in susceptibility exists between varieties of rice and methods of cultivation; e.g., mutants MGS-359 and MGS-859 were especially susceptible and appropriate for use as indicator plants because they are virid. Rice plants are recommended because of their availability throughout Japan, and their availability at the most susceptible stage in June when other indicator plants are not so highly susceptible.

62043 **APTIC NO. 82442**

Nakazawa, S. and T. Oshima

INVESTIGATION OF URBAN ENVIRONMENT FROM PHOTOGRAPHIC INFORMATION (PHOTOSURVEY) PART 1 METHOD AND SURVEY OF VIGOR OF TREES. *(Shashinjoho (shashinsokuryo) ni yoru toshi kankyochosa, 1 system to juseichosa ni tsuite). Text in Japanese. Shibaura Kogyo Daigaku Kenkyu Hokoku (Res. Rep. Shibaura Inst. Tech.), no. 19:237-247, 1975.*

Fundamental data were gathered for a tree-planting program by surveying photometrically the growth state of plants in relation to topography in Suginami Ward, where the living environment is drastically changing. The photographs taken for the purpose were natural color 1972, infrared color 1972, panchromatic 1963 and 1966, panchromato-infrachromatic 1970, and infrared 1971. The methods of evaluating tree vigor is explained. The tree species investigated were pasania, zelkova, ginkgo, Hymalayan cedar, cherry, and pine. The results were summarized in a tree-vigor map. Vigor was in the descending order of ginkgo, Hymalayan cedar, pasania, pine, zelkova and cherry. Along railroads and main roads, vigor was lower.

62044 **APTIC NO. 81765**

Nash, Thomas H., III.

INFLUENCE OF EFFLUENTS FROM A ZINC FACTORY ON LICHENS. *Ecol. Monogr., 45(2):183-198, Spring 1975. 54 refs.*

Lichen species richness and abundance were reduced by approximately 90% in lichen communities near a zinc smelter. The principal cause of the improverished lichen flora in the area was probably high concentrations of zinc. Near the smelters, zinc, cadmium, and sulfur dioxide were all present in sufficiently high concentrations to be detrimental to lichen growth and survival; however, at the perimeter of the lichen impoverished zone, only zinc was present in high enough concentrations to be phytotoxic. Zinc was present in concentrations generally 100 times higher than cadmium. Both metals were experimentally shown to be equally toxic to lichens at the same concentration. (Author abstract modified)

62045 **APTIC NO. 82257**

Nouchi, I., T. Sawada, T. Ohashi, and T. Odaira

PLANT SYMPTOMS OF DAMAGE DUE TO PPN AND THE COMPARISON OF SUSCEPTIBILITY BY TIME OF SOME PLANTS TO OZONE. *(PPN no shokubutsu higaishojo oyobi 2,3 no shokubutsu no ozone jikokubetsu kanjusei no hikaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):453, Nov. 1975. 4 refs.*

Peroxy propionyl nitrate (PPN) was synthetically generated, and herbaceous plants such as tomato, kidney bean and petunia were exposed in an exposure chamber under a fluorescent lamp for 4-8 hours to various concentrations of PPN. At concentrations of more than 100 ppm of PPN, bleaching to severe brown-black necrosis appeared on young to old leaves. At about 30 ppb, symptoms seemingly similar to those due to peroxyacetyl nitrate appeared more severely on younger leaves, with metallic luster and depressed spots not only on the lower surface but on the upper surface. When developing leaves were exposed to PPN, malformed leaves resulted. While PAN damaged many plants at about 1000 ppb, PPN seemed to cause damage at 20-40 ppb. Thus, PPN was considered about 5-10 times as toxic to plants as PAN. Separately, morning glory was exposed to ozone at 40 pphm and radish was exposed at 20 pph, both for 2 hours. When exposed from 1000 to 1500 the damage was larger in morning glory and in radish than when exposed after 1500.

62046 **APTIC NO. 76238**

O Connor, J. A., D. G. Parbery, and W. Strauss

THE SENSITIVITY OF AUSTRALIAN TREE AND SHRUB SPECIES TO SULPHUR DIOXIDE AND OZONE. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975. p. 662-683. 19 refs. (Feb. 17-21.)*

Fumigation studies with 150 Australian ornamental tree and shrub species were performed to assess their relative susceptibility to phytotoxic levels of sulfur dioxide and ozone. Acute injury occurred in sensitive species of Eucalyptus and Acacia after 3 hr of exposure to 1 ppm of SO2 in filtered air. Eucalyptus species were generally the most sensitive to SO2, while Casuarina species were the most resistant, the latter being uninjured after 6 hr of exposure to 3 ppm of SO2. The majority of species studied were relatively resistant to ozone. Injury occurred to only three Banksia species, one Acacia, one Melaleuca, and two Eucalyptus species after 5 hr of exposure to 50 pphm of ozone under conditions which promoted high photosynthetic activity. (Author abstract modified)

62047 **APTIC NO. 83143**

Ohta, Hiroshi, Masaya Kadota, Akiko Adachi, Isamu Sano, and Akie Tsuruizumi

EFFECTS OF AIR POLLUTION ON SOME TREES GROWING IN URBAN ENVIRONMENT (I). CONTENT LEVELS AND EFFECTS OF HEAVY METALS IN LEAVES. *(Taikiosen butsushitsu no shokubutsu ni taisuru eijyo. (I). Shokubutsu shu no jukinzokurui no bunpu to eikyo). Text in Japanese. Aichi Kogyo Daigaku Kenkyu Hokoku (Bull. Aichi Inst. Technol.), vol. 10:215-222, 1975. 6 refs.*

The effects of lead, cadmium, and nickel (mainly due to auto exhausts) on urban vegetation, and of these metals on the contents of necessary trace metals such as copper, zinc, and manganese in the plants and soil were studied. The contents of these metals of leaves of plants such as Cinnamomum comphara, Ginkgo biloba, and Viburnum awabuki in Nagoya City were observed. In plant leaves, no specially high concentrations of metals were found except for lead. The lead content of ginkgo plant leaves was higher in roadside trees (19.0 ppm) compared to trees in a large park (9.9 ppm). The content of lead, cadmium, nickel and copper in the surface soil of roadside tree zone was higher than in deeper soil. No remarkable trend was found for other metals in other plants.

62048 **APTIC NO. 83144**

Ohta, Hiroshi and Akiko Adachi

EFFECTS OF AIR POLLUTANTS ON PLANTS PART 2. METHODS OF DETERMINATION OF HEAVY METALS IN PLANTS. *(Taikiosenbutsushitsu no shoku butsu ni taisuru eikyo 2. Shokubutsuchu no jukinzoku no bunseki ho). Text in Japanese. Aichi Kogyo Daigaku Kenkyu Hokoku (Bull. Aichi Inst. Technol.), vol. 10:223-229, 1975. 6 refs.*

A method of determining heavy metals in plant leaves was devised. It involves washing, drying, pulverizing, drying, then calcinating the leaves in an electric furnace at 450 C for 3 hr, extracting with 1 M-nitric acid, and extracting with hydrochloric acid before determining the atomic extinction coefficient. The method gives results for lead, cadmium, nickel, copper, zinc, and manganese without any interference by acids and other salts, with a S.D. between 0.8 and 2.3%, and a percentage of recovery of 98-102. The analytical results on roadside Ginkgo trees in Nagoya City were 9.0 (19.0), 0.54(0.76), 3.2(3.3), 2.1(6.8), 21(57), and 20(45) ppm of lead, cadmium, nickel, copper, zinc and manganese, respectively, for two sets of measurements, the first in May, the second in October.

62049 **APTIC NO. 84500**

yama, N.

PRESENT STATE AND PROBLEMS OF THE INDUSTRY OF PRODUCING TREE FOR GREENING. *(Ryokkaju seisan jigyo no genjo to mondaiten). Text in Japanese. Koibuchi Gakuen Gakuho (Rep. Koibuchi Coll.), no. 2:27-33, 1975. 6 refs.*

Trees for greening consist of the trees planted in public places such as gardens, parks, roadsides, collective housing areas, and industrial zones to restore the natural environment. The present state of the industry of breeding, nursing and growing such trees is described. One of the problems of the industry with regard to air pollution is to select tree species resistant to air pollution. The evergreens which are resistant to air pollution enumerated herein are Juniperus chinensis, Cephalotaxus harringtonia, Podocarpus Macrophylla, Cycas revoluta, Quercus phillyraeoides, Pasania edulis, Ilex species, and Nerium indicum. The deciduous leaved trees enumerated as resitant to air pollution are Ginkgo biloba, Firmania platanafolia, Acer buergeriana and Sophora japonica. Those sensitive to air pollution are Pinus densiflora, Abies species, Cryptomeria japonica, Zelkova serrata, Prumus yedoensis, Celtis species, and some species of Acer.

62050 **APTIC NO. 76619**

Parthasarathy, S., N. Arunachalam, K. Natarajan, G. Oblisami, and G. Rangaswami

EFFECT OF CEMENT DUST POLLUTION ON CERTAIN PHYSICAL PARAMETERS OF MAIZE CROP AND SOILS. *Indian J. Environ. Health, 17(2):114-120, April 1975. 8 refs.*

The effect of cement dust air pollution on certain physical parameters of maize crop and soils was investigated. Cement dust deposition varies with the distance from the kiln, and the fourth and fifth leaves of maize have comparatively more dust than the first three leaves from the top. The plants exposed to cement dust deposition show a suppression of leaf size, number and size of cobs, and plant height when compared to plants in non-polluted fields. The soil from cement dust polluted fields shows a decrease in water holding capacity and pore space while thermal conductivity and specific heat increase. Artificial mixtures of red and black soils with cement dust show similar trends as those of the field sample. The black soil is affected more seriously than the red soil (Author abstract modified)

62051 **APTIC NO. 80018**

Payer, H. D. and C. J. Soeder

ACCUMULATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN CULTIVATED MICROALGAE. *Naturwissenschaften (Berlin), 62(11):536-537, 1975. 5 refs.*

The relationship between air pollution and the polycyclic aromatic hydrocarbon concentration in microalgae cultured extensively under open-air conditions was studied. Algae samples were taken from Dortmund and from Bangkok. A statistical distribution pattern for the 3,4-benzopyrene, 3,4-benzofluoranthene, indenopyrene, fluoranthene, 1,12-benzoperylene, and 11,12-benzofluoranthene in the dry matter of microalgae is presented. The polycyclic contents of Scenedesmus tended to follow a lognormal distribution. Therefore, the median values and not the averages of values from different stations have to be used for a comparison. Comparison of the statistical distribution of the concentrations of the individual polycyclics shows that the carcinogenic substances are lognormally distributed, whereas the polycyclics without carcinogenic activity show a normal distribution (in the samples from Bangkok). This raises the question of whether polycyclic hydrocarbons are endogenously synthesized by plants. The low pollutant concentration in algal substances from Thailand does not agree with recently published opinions. The present investigation demonstrates that it is possible to produce in open ponds microalgae with a load of environmental pollutants no higher than that of emergent parts of terrestrial higher plants.

62052 **APTIC NO. 76246**

Plank, C. O., D. C. Martens, and D. L. Hallock

EFFECT OF SOIL APPLICATION OF FLY ASH ON CHEMICAL COMPOSITION AND YIELD OF CORN (ZEA MAYS L.) AND ON CHEMICAL COMPOSITION OF DISPLACED SOIL SOLUTIONS. *Plant Soil, 42(2):465-476, 1975.*

Field investigations of the effects of weathered fly ash samples on the yield and nutrient concentration of corn (Zea mays L.) and on the composition of displaced soil solutions were conducted. The application of weathered ash at rates ranging from 18-288 metric tons/hectare did not decrease corn grain yields on either Groseclose silt loam or Woodstown loamy fine sand. Corn grain yields were increased on the Woodstown soil where cumulative rates of 216 and 288 metric tons/hectare of fly ash were applied. This effect was attributed in part to an increase in soil moisture. Plant analyses of boron and manganese concentrations did not reveal toxic levels of these two elements. Soil solution data verified that toxic amounts of these elements were not released from the weathered ash sample. The calcium content of displaced soil solutions was increased by fly ash application but was not sufficiently high to effect increases in Ca content of corn tissue. Weathered fly ash was applied to soils at cumulative rates of up to 288 metric tons/hectare without adversely affecting crop growth. (Author summary modified)

62053 **APTIC NO. 84290**

Prinz, Bernhard and Robert Guderian

EFFECTS OF AIR POLLUTANTS ON PLANTS. *(Wirkungen von Luftverunreinigungen auf Pflanzen). Text in German. In: Fundamentals of Air Conservation and Noise Abatement in North Rhine Westphalia, p. 40-46, 1975.*

The effect of air pollution on plant life is discussed. Photosynthesis is impaired, acute necrosis of leaves and chronic damage involving sublethal changes due to increasing accumulation of pollutants occurs. Damage to vegetation is often an early indicator of intolerable atmospheric pollution, resulting in measures taken against the sources. Most pollutants produce injury to plant life at concentrations apparently irrelevant for man. Sensitivity of plants to hydrogen fluoride, compared to man s response threshold, is 0.3-1.4 microgram F/cu m: 50 micro g F/cu m. Phytotoxicity of air pollutants over a total area of 3000 sq km with a regional resolution of 5 km was examined. Among them were sulfur dioxide, gaseous fluorine compounds, hydrogen chloride, nitrogen oxides, photooxidants, and dust. A pasture grass was exposed for 2 wk, then examined for its content of sulfur, iron, lead, zinc, and cadmium.

62054 **APTIC NO. 80013**

Rauter, Walfried

MUSHROOMS AS INDICATORS OF MERCURY EMISSIONS. *(Pilze als Indikatoren fuer Quecksilberimmissionen am Standort einer Chlor-Alkali-Elektrolyse). Text in German. Z. Lebensm. Unters. Forsch. (Munich), 159(3):149-151, 1975. 4 refs.*

The natural mercury content of wild mushrooms from different geological districts of Austria were measured. Mushrooms collected in the vicinity of a chlor-alkali plant contained about 10 times this background average of mercury, occasionally reaching 100 ppm. Species of mushroom that decompose vegetable mould through an extensive mycel in the soil accumulate large amounts of mercury, because of the high mercury content of tree leaves and needles that fall in the vicinity of chlor-alkali plants. Common mushrooms suitable as indicators for the study of mercury pollution include lycoperdon gemmatum, mycena pura, and all collybiaceae. (Author abstract)

62055 **APTIC NO. 82632**

Reuss, John O.

CHEMICAL/BIOLOGICAL RELATIONSHIPS RELEVANT TO ECOLOGICAL EFFECTS OF ACID RAINFALL (FINAL REPORT). *Environmental Protection Agency, Corvallis, Oreg., National Ecological Research Lab., Program Element 1AA006, ROAP/Task 21ALU32, Rept. EPA-660/3-75-032, 51p., June 1975. 20 refs.*

Problems associated with the measurement of rainfall acidity are reviewed along with the possible effects of rainfall acidity on soil-plant systems. Hydrogen ion inputs from rainfall to soil and aquatic systems which are calculated from weighted average pH measurements without regard to bicarbonate levels or carbon dioxide partial pressures may be seriously in error. Alternative methods include: the subtraction of bicarbonate levels from hydrogen ion levels, the use of net titratable acidity, and the subtraction of basic cation levels from acid anion levels. The potential of rainfall to acidify soil or waters is characterized by its containing more acid anions than basic cations, and this excess of anions can be an appropriate measure of the capacity of rainfall to contribute to the acidity of soil-water systems. The oxidation of ammonium ions contained in rainfall may result in a hydrogen ion production which is similar in magnitude to the direct input of hydrogen ions in acid rain, and the consideration of this process complicates the interpretation of rainfall induced hydrogen ion loading. Fluxes of hydrogen ions due to plant uptake process may also complicate the measurement and interpretation of rainfall effects. (Author conclusions modified)

62056 **APTIC NO. 80493**

Rhoads, A. F. and E. Brennan

FLUORIDE DAMAGE TO WOODY VEGETATION IN NEW JERSEY IN 1974. *Plant Disease Reptr., 59(5):427-429, May 1975. 7 refs.*

The impact of air pollution on trees in New Jersey was surveyed. Two incidents of severe damage to woody plants by fluorides emitted from specific industrial sources were observed. Classic fluoride toxicity symptoms were obsered on plant species that are generally regarded as sensitive, and also on several species of oak. The symptoms on pine were unusual in that a dark band delimiting the necrotic area on the needle appeared 3-4 wk after the initial injury occurred. Douglas fir and peach trees that were defoliated by the pollutant put out a second flush of growth. Among the species exhibiting extreme resistance to fluoride damage were American holly, white birch, London plane, flowering dogwood, magnolia, mulberry, apple, and Norway maple. (Author abstract modified)

62057 **APTIC NO. 82315**

Saeki, M. and T. Suzuki

ON THE STUDY OF DETERMINATION OF AIR POLLUTION UTILIZING LICHENS AS THE INDICATOR. *(Chii-rui o shihyo to suru taikiosen no sokutei ni kansuru kenkyu). Text in Japanese. Koshu Eisei Joho (Public Health Inform), 5(11):19, 1975.*

The lichen cover (Parmelia spp. and Anaptychia sp.) on tombstones in 46 public cemeteries in Sendai, Shiogama, Izumi Tagajo, Rifu, and Nanagahama was studied in 1973. The ratio of total epiphytic area to the number of stones capable of supporting epiphytes was classified into 5 degrees (A-E). A comparison of the distribution of these degrees and the distribution of sulfur dioxide in the atmosphere was mapped. Lichens attached to pine trees around a thermal power station were also studied. The content of heavy metals in the lichens at 30 points was determined to see the effect of lead in auto exhaust. No lichen was found in the area where SO was more than 0.02 mg/100 sq cm/day (yearly average). The epiphytic coverage decreased as the distance from the power station increased. The content of lead in Parmelia consperasa was relatively large near the railroad station of Sendai, and fell as the distance from the station increased.

62058 **APTIC NO. 82499**

Saeki, Morito, Kyoshi Kunii, Toshihiko Seiki, and Tsuguyoshi Suzuki

A LICHEN (PARMELIA CONSPERSA) SURVIVING WITH ELEVATED CONCENTRATIONS OF LEAD AND COPPER IN THE CENTER OF SENDAI CITY. *Bull. Environ. Contamination Toxicol., 14(6):726-730, Dec. 1975. 6 refs.*

The significance of heavy metals for the survival of lichens in Japan is discussed. The city of Sendai and its surroundings were studied. Lichens were surveyed annually since 1973, mainly in the graveyards of temples scattered fairly uniformly in the study area. Generally lichens were found infrequently in the center of the city compared with the periphery. Only one species was occasionally found in the center of Sendai city. After washing, drying, and oxidation with chemicals, lichen specimens were measured for lead and copper content by atomic absorption spectrometry. The concentrations of lead and copper in the lichens did not show orderly relationships to the distances of sampling sites from either of two metal refineries just outside of the densely populated area. The concentrations of lead and copper in lichens sampled from the densely populated area were higher, and they decreased reciprocally with distance from the center of the area. Elevated concentrations of lead and copper in the surviving lichens in the center of the city may be the result of air pollution originating from an aggregated human population, especially by automobile driving. Many factors such as aridity, elevation of temperature, increase of evaporation, and air pollutants are likely contributors to the decay of lichens in the urban environment. The influence of metals in atmospheric air is also not negligible. Nevertheless, the reason why this species has survived in the center of the city is not known. The sensitivity of lichens to metals may differ according to genus or species. Therefore, it is impossible to compare the results of studies on different species.

62059 **APTIC NO. 84056**

Saikawa, Masatoshi and Shigeru Kajikawa

A FINE STRUCTURAL STUDY ON THE CHLOROPLAST IN DAMAGED LEAVES OF ROADSIDE PLANTS. *(Jidosha no haigasuosen ni yotte shojita byoyo ni okeru yorokutai no bisaikozo). Text in Japanese. Tokyo Gakugei Daigaku Kiyo Dai 4 (Bull. Tokyo Gakugei Univ. Ser. IV), vol. 27:205-217, 1975.*

The scanning abstractor believes that the authors own abstract on page 210 would be appropriate to be adopted. Euonymus japonica, Hydrangea macrophylla var. otaksa, and Cayratia japonica grown along the road in Tokyo were found to have necrotic lesions, several kinds of mottling, and mildew. Photochemical oxidants from automobiles were thought to be the cause of damage. Microscopic examination of leaf tissues revealed chloroplasts invaginations and pseudopod-like protusions. The invaginations often contained mitochondria, a common feature in electron microscopic examination of degenerating chloroplasts. Aggregations of phytoferritin particles, each about 70-100 A, were seen in leaves of E. japonica infected with Euonymus mosaic virus and powdery mildew, and in the leaves of H. macrophylla var. otaksa showing necrotic lesions. These were similar in appearance to those of phaseolus vulgaris exposed artficially to peroxyacetyl nitrate, ozone, and dioxynitrate, and to those of Pharbitis exposed to ozone.

62060 **APTIC NO. 79584**

Sakihara, K., A. Sugimae, and K. Matsuo

STUDIES ON THE EFFECTS OF DUSTS TO TREES PART II. DETERMINATION OF ELEMENTS IN PINE LEAVES BY SPARK IONOGEN MASS SPECTRAL ANALYSIS. *(Funjin no jumoku e no eikyo ni tsuite, II, Sparkiongen shitsuryo bunsekiho ni yoru matsubachu no genso ganyuryo no bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):459, Nov. 1975.*

Contents of elements in and on pine leaves having no visible damage due to air pollution were determined by spark ionogen mass spectrometer to examine local differences in air pollution. The leaves were collected from 4 different places in Osaka Prefecture in Dec. 1974. The barium, cesium, iodine, antimony, tin, cadmium, zirconium, yttrium, and chromium concentrations shows that lead, Cr, Cs, Sb, Sn and Zr were higher in the leaves of trees in industrial zones and semi-industrial zones than in residential zone (especially those of Pb and Cr). Those elements found adhering to leaves which were found more in polluted areas (industrial- and semi-industrial zones) than in residential areas were Pb, Cs, Sb, Zr, and Cr.

62061 **APTIC NO. 79635**

Sakurai, S., K. Itai, S. Nakaya, and F. Tsunoda

STUDIES ON AIR POLLUTION DUE TO FLUORIDES PART 15. ON THE ENVIRONMENTAL POLLUTION DUE TO FLUORIDES AROUND PHOSPHATE FERTILZER FACTORIES. *(Fukkabutsu ni yoru taikiosen ni kansuru kenkyu Part 15. Rin-hiryo kojo shuken ni okeru fukkabutsu ni yoru kankyo osen ni tsuite). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 22(10):398, Nov. 1975.*

Indicator plants such as iris and pine and agricultural crops such as Welsh onion were collected within a radius of 3 km from a superphoshate factory (A) and a fused phosphatic fertilizer factory (B), and their fluorine contents were determined. The fluorine content of iris was 9.9-78.5 ppm of dried plant, corresponding to a gaseous fluorine content in air of 0.04-0.33 ppm, and 0.15 ppm of soluble particulates around the A factory. The fluorine content of air around the B factory was a little higher than that at the A factory, and although the fluorine content in Welsh onion was 11.2 ppm of dried plant there were plants containing more fluorine, such as iris (93.8 ppm), platanas (295 ppm) and acer (117 ppm). Both factories visibly damaged the plants around them.

62062 **APTIC NO. 80064**

Sakurai, S.

POLLUTION OF AGRICULTURAL CROPS BY FLUORIDE IN AIR, ESPECIALLY ON BROWN RICE. *(Taikichu fukkabutsu ni yoru nosakubutsu osen - tokuni gen-mai ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):231-232, Nov. 1975.*

Results of a nation wide determination of the fluorine content of brown rice harvested from fields around fluorine sources are reported. The fluorine content of brown rice harvested in fields without specific fluorine sources ranged from 0.5-1.5 ppm of dried specimen. The fluorine content of brown rice harvested from fields within 1 km of an aluminum refinery ranged from 1 to 8 ppm of dried specimen, according to the wind direction. The accumulation of fluorine in brown rice was highest around aluminum refineries and pottery works, followed by phosphate fertilizer factories. These findings indicate that the amount of fluorine intake from the staple food, rice, is far more than that from inhalation. The fact that the accumulation of fluorine in leaf-vegetables such as Chinese cabbage is higher than in brown rice indicates the necessity for further study.

62063 **APTIC NO. 82416**

Sawada, Tadashi, Isamu Nouchi, Takeshi Oohashi, and Toshio Oodaira

MORNING GLORY AS OXIDANT INDICATOR. *Tokyo-To Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), vol. 1975:1-8, 1975. 5 refs.*

The use of the morning glory (Scarlet Ohara) as an indicator for oxidant was investigated by exposing the plant to ozone, peroxyacetyl nitrate (PAN), and nitrogen dioxide. Injury from O3 occurred at 15 pphm, 4-8 hr after exposure. Injury was chiefly in the form of bleached spots between internal veins or spots of necrosis. Glazing or bronzing bruised regions developed on the lower surface of the leaf after 24-hour exposure to PAN at 15 pphm. Three hours of exposure to 2.5 ppm NO2 caused large yellowish brown necrotic regions between veins of the mature leaf. In field surveys spots or chlorosis, bleached spots, and spots of necrosis developed in that order, as the level of exposure increased. Injury was observed when the oxidant concentration in the ambient air was either more than 15 pphm at an exposure time of over 2 hr, or more than 80 pphm/hr in terms of daily dose. Oxidant induced injury to the morning glory was due to O3. (Author summary modified)

62064 **APTIC NO. 82503**

Schramel, M.

INFLUENCE OF SULPHUR DIOXIDE ON STOMATAL APERTURES AND DIFFUSIVE RESISTANCE OF LEAVES IN VARIOUS SPECIES OF CULTIVATED PLANTS UNDER OPTIMUM SOIL MOISTURE AND DROUGHT CONDITIONS. *Bull. Acad. Polon. Sci. Ser. Sci. Biol., 23(1):57-63, April 1975. 4 refs.*

The influence of 0.5 ppm sulfur dioxide on stomatal apertures and diffusive resistance of leaves in various species of cultivated plants under optimum soil moisture and drought conditions was investigated. Controls under optimum soil moisture conditions had stomatal apertures more widely opened and a lower diffusive resistance while in controls under drought conditions stomatal apertures were narrower and diffusive resistance of leaves was higher. Gassing with SO2 under drought conditions caused a wider opening of stomatal apertures but had no noticeable effect on diffusive resistance, which remained relatively high. The protective effect of drought may be connected with the higher diffusive resistance of leaves, which prevents adsorption of gas, but is not associated with the influence of gas on movement of the stomata. (Author abstract modified)

62065 **APTIC NO. 80324**

Sokol, R. A. and D. A. Klein

THE RESPONSES OF SOILS AND SOIL MICROORGANISMS TO SILVER IODIDE WEATHER MODIFICATION AGENTS. *J. Environ. Quality, 4(2): 211-214, April-June 1975. 18 refs.*

The effects of silver iodide weather modification agent accumulation on microbial growth, anaerobic cellulose degradation, and the soil environment adjacent to a cloud seeding generator were investigated. Silver ion from silver nitrate inhibited microbial growth in cultures at concentrations as low as 6 times 10 to the -9th power g/ml, and cultures saturated with AgI displayed an inhibition of growth initiation approximately equivalent to 35 times 10 to the -9th g/ml Ag ion. Muds containing AgI exhibit significantly decreased anaerobic cellulose degradation rates in long trm experiments, when concentrations of 100 microgram AgI/g were present. In soil surrounding a seeding generator, deposited Ag tended to remain near the soil surface. Alterations in the soil environment due to high Ag concentrations were indicated by consistently higher organic matter levels, water contents, microbial populations, and rates of soil respiration. High concentrations of seeding agent potentially alter the soil microbial environment by inhibiting organic matter decomposition, but the Ag levels which accumulate in seeded target areas should have no overt effects on the soil environment. (Author abstract modified)

62066 **APTIC NO. 76293**

Stoeckli, B., R. Braendle, and K. H. Erismann

EFFECTS OF LOW SO2 CONCENTRATIONS ON THE MITOTIC ACTIVITY AND ON THE CELL CYCLE OF DUCKWEED (LEMNA MINOR L.). *(Mitoseaktivitaet und Zellzyklus unter Begasung mit subletalen SO2-Konzentrationen bei der Wasserlinse (Lemna minor L.)). Text in German. Experientia, 21(7):795-796, July 1975. 24 refs.*

The long-term and short-term effect of a sublethal sulfur dioxide concentration of 0.6 ppm on the mitotic activity, cell cycle, and certain cytometric parameters in adventive roots and apical meristems of duckweed (Lemna minor L.) were studied, using tritiated thymidine for certain tests. The mitotic index, determined to be 5.3 + or - 0.8% as an initial level, decreased insignificantly by 5-6% after 77-day exposure. Sharp reduction of the labeling index and of the thymidine incorporation were observed after short-term exposure. The cell cycle seemed to increase by 0.5 hr after 77-day expsoure. The considerable shrinkage of the cell nuclei in the apical meristim is indicative of the considerable response to sublethal concentration.

62067 **APTIC NO. 79633**

Suda, B., H. Shioi, I. Kimura, T. Yoshida, Y. Sato, S. Sakurai, S. Nakaya, K. Itai, Y. Suzuki, Y. Yazaki, and F. Tsunoda

EXPOSURE EXPERIMENTS OF GOATS TO ENVIRONMENTAL POLLUTION DUE TO FLUORIDE IN AIR PART VI. CLINICAL EXAMINATION DATA AND PATHOLOGICAL FINDINGS. *(Taikichu fukkabutsu no kankyo osen ni yoru yagi no bakuro jikken Part 6. Rinsyo kensa seiseki oyobi byorishoken). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):480, Nov. 1975.*

Results of periodic clinical and histological examination during past 3 years of goats reared in an area around an aluminum refinery where concentration of hydrogen fluoride in air was 0.5-1.0 ppb and fluorine content of pasturage was 30 ppm (four times larger than that in the control area) are given. Although serum fluorine content was apparently higher than in the control group, tests for anemia and hepatic and renal functions showed no difference between experimental and control animals, and abnormal findings in exposed animals which were not seen in the control group were not obtained.

62068 **APTIC NO. 82208**

Sugai, Ryuichi

PRESENT SITUATION OF FLUORIDE ENVIRONMENTAL POLLUTION. *(Fukkabutsu ni yoru kankyo osen no jittai). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):199-205, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975.)*

The Niigata Prefectural Environmental Pollution Research Institute reports the state of air pollution caused by fluorides. An air pollution investigation was conducted in 1969 in the neighborhood of an aluminum refining plant in the Naoetsu littoral industrial belt. This aluminum refining plant started operation in May 1963 and is the main source of fluorides, and the largest single aluminum refining plant in Japan. A few years before the plant was first operated, no significant agricultural damage was seen. Since autumn of 1967 damage to vegetation has been obvious, and has increased in relation to the multi-stage expansion of the plant. Yearly changes of concentration of airborne fluorides, present concentrations, gaseous fluorides and particulate fluorides, and the effects of airborne fluorides on vegetation are discussed.

62069 **APTIC NO. 84558**

Sugimoto, E.

STUDIES ON DAMAGE DUE TO AIR POLLUTION-ON THE FLUORINE CONCENTRATION IN NEEDLES OF PINES IN FUKUI AND SAKAI AREAS. *(Taikiosen ni yoru jumoku no higai ni kansuru shiken, Fukui, Sakai chiku ni okeru matsu shinyo chu no fusso nodo ni tsuite). Text in Japanese. Fukui-ken Ringyo Shikenjo Hokoku (Annu. Rep. Fukui Prefect. For. Exp. Stn.), no. 13:96-101, 1975. 4 refs.*

Samples of needles of Pinus thunbergii and P. densiflora grown at points in Fukui and Sakai 1, 2, 3, 5, and 7 km remote from a place where factories were to be built were taken yearly for 3 years beginning in 1972, early in August when the growth of new leaves is finished. The fluorine content of the samples was determined. The average for 3 years of new leaves for P.t. was 0.8-2.6 ppm (average of 1.6 ppm); second year leaves of P.t. showed 2.4-3.7 ppm (average of 3.1 ppm); third year new leaves of P.d. had 1.4 ppm, second year leaves 3.1 ppm. When these values were compared to those in air polluted areas and non-polluted areas, it was found that the fluorine content of pine leaves collected in the Fukui and Sakai areas was in the range of natural environmental concentrations. There was a difference of fluorine content between new leaves and second year leaves, the latter containing more fluorine. This was due to more absorption of fluorine via roots.

62070 **APTIC NO. 82440**

Sugino, M. and K. Ashida

AIR POLLUTION AND URBAN VEGETATION PART 3. METHOD OF CONTROLLING POLLEN FORMATION AND PLANT HEIGHT OF VEGETATION OF SOLIDAGO ALTISSIMA. *(Taikiosen to Toshishokusei 3. Seitakaawadachiso gunraku no kafunseisan to kusatake no yokusei hoho). Text in Japanese. Kinki Daigaku Kogai Kenkyusho Kenkyu Hokoku (Kinki Univ. Pollut. Res. Inst. Rep.), vol. 3:119-128, 1975. 9 refs.*

Solidago altissima has not been proven to be a cause of pollenosis. Its height and large quantity of pollen suggest it may be a source of irritation. The seasonal nature of its growth makes mowing from May to October a feasible control measure.

62071 **APTIC NO. 82867**

Sugiura, K.

REPORT OF A SURVEY OF THE ATMOSPHERE BY PLANT INDICATORS. *(Shihyo shokubutsu ni yoru kankyo taiki chosa kekka hokokusho). Text in Japanese. 44p., March 1975.*

Morning glory (Scarlet O Hara variety) was transplanted to 41 middle and primary schools in the Aichi Prefecture on June 4 - 12, and the degree of damage was assayed in July, and August. The growth state of the plants did not differ with locality. The overall average damage (% of injured leaves) was 29.8%. The oxidant concentration was lower in June, but higher in August. There was one photochemical smog alert in June and 3 in August. The areas where the damage was great (leaf injury greater than 60%) were the Minami and Minato Wards and Nagoya, Kasugai, Chita, Tokoname and Okazaki Cities. The areas where damage was very slight (leaf injury less than 10%) were the Showa and Nakamura Wards of Nagoya City, Obu, Handa, Kariya and Hekinan Cities. No damage was observed in one town and one village. In 3 areas, reddish-purple and yellow discolorations of the leaves were observed, the cause of which was not determined.

62072 **APTIC NO. 83723**

Suketa, Yasunobu, Yoshio Masui, Shuji Hayakawa, Yoko Sugeno, and Takeo Yamamoto

EFFECT OF HYDROGEN FLUORIDE GAS ON METABOLISM OF GLADIOLUS, IRIS AND CROCUS. *(Gurajiorasu, airisu oyobi kurokkasu no daisha ni oyobosu fukkasuisogasu no eikyo). Text in Japanese. Nippon Nogeikagakku Kaishi (J. Agr. Chem. Soc. Japan), 49(12):647-652, 1975. 17 refs.*

Gladiolus gandavensis, Iris hollandica, and Crocus vernus grown by hydroponics were exposed to hydrogen fluoride at 3.1-3.4 microgram of F(-)/cu m for 24 hr/day or 8 hr/day in light or dark, for total exposure times as long as 20 days. The respiratory quotient of leaves of all the plants declined with exposure. Oxygen absorption by leaves of gladiolus increased conspicuously with exposure in the light, but decreased a little with exposure in the dark. The protein content of Gladiolus leaves decreased conspicuously after exposure in the light, but showed no change after exposure in the dark. The activity of acid phosphatase was inhibited by exposure; the degree of inhibition was largest in Gladiolus, followed by Iris, then Crocus. The relative value of acid phophatase activity (Y) yielded a regression curve as a function of the respiratory quotient (X): Y equals 0.897X + 0.003 in the three species of Iridaceac, with a correlation coefficient of 0.983. These facts show the possibility of using acid phosphatase activity as an indicator of fluoride pollution in the air.

62073 **APTIC NO. 79585**

Takasaki, T., Y. Matsuoka, T. Ono, M. Morikawa, T. Matsumaru, and K. Shiratori

ON THE YIELD OF PEAR FRUIT IN AIR POLLUTED AREA. *(Taikiosen chiiki ni okeru nashi no shuryo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):461, Nov. 1975.*

The relationship between air pollution, especially the total amount of exhaust sulfur oxides and the sulfur content of leaves of pear trees grown in an orchard near an industrial zone, has been investigated since 1968 in Chiba Prefecture. As the total amount of exhausted sulfur oxide declined, the sulfur content of pear tree-leaves became less. The relationship between the yield of pear fruits and the sulfur content of pear leaves showed a negative linear correlation with a correlation coefficient of 0.674 (significant at 1%).

62074 **APTIC NO. 73940**

Taniyama, T.

AGRICULTURAL CROP DAMAGE DUE TO AIR POLLUTION, ESPECIALLY OF RICE PLANTS IN THE YOKKAICHI AREA. *(Taiki-osen ni yoru sakumotsu higai, tokuni yokkaichi chiiki ni okeru suito higai ni tsuite). Text in Japanese. Preprint, Japan Society of General Research, Div. of Environmental Science, p. 81-82, 1975. (Presented at the Japan Society of General Research. Environmental Science Division Meeting, 1st, Tokyo, Japan, June 6-8, 1975, Paper 034.)*

The growth and yield of rice plants and rice in air polluted Yokkaichi during 1972 and 1973 are studied. The rice crop of the area was yearly reduced by polluted air from the Yokkaichi industrial combination, consisting mainly of sulfur dioxide. Crop reduction shows a close relationship to morbidity of Yokkaichi asthma. Root growth of the rice plants was inhibited by SO2, and damage then appeared as reduction of dry matter and production of grain, resulting in a crop decrease.

62075 **APTIC NO. 82355**

Taniyama, Tetsuro

ON THE CHARACTERISTICS IN THE GROWTH AND GRAIN PRODUCTION OF RICE PLANT IN AIR POLLUTION AREA (YOKKAICHI), AND THE SIGNIFICANCE AS THE INDOOR PLANT FOR MONITORING OF AIR POLLUTION. *Preprint, Mie Univ., Japan, Dept. of Agronomy, p. 53, 1975. (Presented at the International Congress of Scientists on the Human Environment, Kyoto, Japan, Nov. 17-26, 1975.)*

Air pollution from steam power installations, refineries, and petrochemical factories in Yokkaichi City affects the sur-

rounding farming area from May to September when summer crops are grown. The relationships between dry weight and grain production in the rice plant and sulfur oxides in the air were studied. The significance of rice as an indicator plant for monitoring air pollutants is discussed in terms of the relationship between the number of patients with Yokkaichi asthma, caused by sulfur oxides in the air, and the continuous decrease of grain production of rice plants in the area since the first petroleum combine started up in 1958. The number of panicles/hill was most affected by sulfur oxides. The correlation between total dry weight or grain yield and concentration of sulfur oxides in the Yokkaichi area was significant, but no visible injury to the leaf or leaf sheath occurred during the growing period. Total dry weight decreased 50% and grain yield decreased 35%, the damage being most severe in 1961 and 1965. There was a significant correlation between percentage of grain production in the Yokkaichi area and the number of cases of Yokkaichi asthma, which was first observed 5 yr after the decrease in grain production began.

62076 **APTIC NO. 83800**

Taniyama, T. and I. Kawada

EFFECTS OF HEAVY METALS CONTAINED IN THE EXHAUST OF A CEMENT PLANT ON THE GROWTH AND YIELD OF RICE PLANT AND CROP. *(Cement kojo haien chu no jukinzoku nado ga ine no seiiku seisan ni oyobosu eikyo). Text in Japanese. Nippon Sakumotsu Gakkai Tokaishibu Ho (Japan. Soc. Sci. Crops Tokai Branch Rept.), no. 73:32-40, 1975. 7 refs.*

Experiments comparing the growth and crop yield of rice grown in soil polluted by heavy metals (5.5 ppm of cadmium, 271 ppm of zinc, 360 ppm of lead, and 160 ppm of copper) from the exhaust of a cement plant in Fujiwara to a control group grown in ordinary soil are described. The effects of heavy metals appeared in the dried weight of leaves, stems, and roots, and as enlargement of the leaf-area. The effects was more severe in paddy rice than in upland rice. The distribution of heavy metals and the reduction of the rice crop showed a consistent correlation. A linear relationship was found between the rate of increase of cement production and the rate of decrease of the rice crop in Fujiwara in Mie Prefecture. The effects of Cu, nickel, cobalt, and Zn were discussed.

62077 **APTIC NO. 83238**

Taoda, Hiroshi

BRYOPHYES AS INDICATORS OF AIR POLLUTION. *Preprint, International Congress of Scientists on the Human Environment, p. 24, 1975. (Presented at the International Congress of Scientists on the Human Environment, Kyoto, Japan, Nov. 17-26, 1975.)*

Epiphytic bryophytes and lichens are used as indicators of air pollution. Tokyo was divided into zones according to the epiphytic bryophytes on broad-leaved trees. The average sulfur dioxide concentration was estimated in each zone: over 0.05 ppm in zone I, 0.04 to 0.05 ppm in zone II, 0.02 to 0.04 ppm in zone III, 0.01 to 0.02 ppm in zone IV, and below 0.01 ppm in zone V. Zone I is epiphyte desert, and zones II, III, and IV are struggle zones. The species of bryophytes are divided into four groups: species penetrating into the inner part of the struggle zone, Clastobryella kusatsuensis and Glyphomitrium humillimum; species penetrating into the suburban area, which is the outer part of the struggle zone; species occurring at the edge of the urban area; and species occurring optimally in rural areas. An instrument which uses cultivated bryophytes for measuring the toxity of air pollutants is described. The degree of pollution can be estimated by the growth rate or the degree of injury of bryophytes in the unfiltered growth chamber in comparison with that in the filtered chamber. Its advantages include the ability to measure synergistic action of pollutants, small size, usefulness throughout the year, and usefulness in areas without natural epiphytic vegetation.

62078 **APTIC NO. 84095**

Tatekawa, H., T. Sugano, B. Sugaya, and T. Ikeda

STUDIES ON THE ANALYSIS OF CROP DAMAGE DUE TO POLLUTED SOIL BY HEAVY METALS PART 9. SIMPLE METHOD OF EVALUATION OF CADMIUM-POLLUTED RICE GRAIN DUE TO AIR AND WATER POLLUTION. *Jukinzoku dojo osen ni yoru nasakubutsu higai no kaiseki ni tsuite). Text in Japanese. Japan. Soc. Soil Sci. Manure Annu. Meet., 21st, 1975.*

In Japan, brown rice grains are officially classified by cadmium content as less than 0.4 ppm, 0.4-1.0 ppm, and more than 1.0 ppm. Experiments on the determination of cadmium content were carried out to find a simple and rapid method. The increase of falling dust was proportional to the cadmium content of brown rice grains. Although in the range of the experiment no grain contained more than 0.4 ppm of cadmium, it was presumed that the content would reach 0.4 ppm when the amount of dustfall increased.

62079 **APTIC NO. 79587**

Tatsumi, S., H. Murakami, and H. Matsumoto

ON THE DAMAGE OF VEGETATION IN THE GREE TRACTS IN NIIGATA CITY DUE TO AIR POLLUTION. *(Taikiosen ni yoru niigata shinai ryokuchi no shokusei higai ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):458, Nov. 1975.*

Damage to vegetation in green tracts such as coastal sand-proof woods, municipal parks, and natural greens due to air pollution was especially marked in the pines and ginkgos among such tree species as Robinia pseudoacacia, Pinus thunbergii, Pinus densiflora, poplar, ginkgo, platanus and Viburnum awabuki. Heavy metal (copper, zinc, lead) contents of soil in the middle part of natural greens were generally larger than those in soil in the road-side part of the greens.

62080 **APTIC NO. 79588**

Tatsumi, S., T. Ishikawa, and T. Ando

ON THE POLLUTION BY HEAVY METALS IN THE GREEN TRACTS OF NIIGATA CITY. *(Niigata shinai ryokuchi no jukinzoku osen ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):457, Nov. 1975.*

Heavy metals content (lead, zinc, copper, cadmium, manganese and iron) in leaves of trees planted in industrial, commercial, residential and coastal areas in Niigata City were determined. Only zinc was abundant in leaves of plants in parks near industrial areas. In road-side trees planted in the four areas near industrial activity, all the metals except manganese were abundant. Lead, zinc and iron were detected in high concentrations in the leaves of pine trees planted on the coast, probably because of a national road there. Another finding was the reduction of the total number of soil fungi, accompanying the weakening of vegetation in green tracts of the City.

62081 **APTIC NO. 82100**

Terakado, K. and H. Hatta

ON THE OCCURRENCE OF PHOTOCHEMICAL SMOG AND PLANT DAMAGE IN 1974. *(Showa 49 nendo kokagaku smog to shokubutsu higai no hassei ni tsuite). Text in Japanese. In: 1974 Tokyo Metropolitan Agricultural Experiment Station Prompt Report, p. 46-49, 1975.*

Photochemical smog forecasts and smog alarms in 1974 were issued, respectively, 25 times and on 26 days in Tokyo; fewer than in 1973. It was noticed that 40-60% of the forecasts and alarms in 1973 were concentrated in July and Aug., while in 1974 only a third of them were concentrated in the same months. The total hours when oxidant concentration was more than the standard (0.15 ppm/hr) numbered 239, less than in 1973. Plant damage due to photochemical smog was seen in petunia (April 12, 18, 20 and 27), zelkova (June 10 and later; untimely leaffall), sunflower, salvia, dahlia, and miniature tomato (June 25 and 26 during a continued occurrence of high concentrations of oxidant. Luster on the lower sides of leaves and black spots on the upper sides of leaves of tomato and morning glory (7 times in July, 11 times in Aug., and twice in Sept. were notable). The total number of plant damage incidents was smaller in 1964 than in 1973; yet there was a slightly lower concentration of oxidant in 1973. In Sept. of 1964 the damage occurrence was noticeably less, about 60% of that in 1973.

62082 **APTIC NO. 80057**

Tsuji, J.

A STUDY ON ENVIRONMENTAL POLLUTION BY AN ANTIMONY REFINERY. *(Anchimon seiren kojo no kogai ni kansuru kenkyu). Text in Japanese. Shiga Pref. Sericultural Exp. Stn. Proc., no. 32:17-24, 1975.*

A sericulture failure due to silkworm jaundice in Maibara in autumn of 1969, possibly caused by exhaust from an antimony refinery, led to an investigation. The material on the mulberry leaves fed to the silkworms was analyzed. The direct effect of sulfur dioxide and antimony on silkworms was tested. The disease was apparently induced by sulfur dioxide from the refinery, and exaggerated by antimony compounds. The lowest limit of an antimony and potassium tartarate compound which damaged the silkworms was found to be 300 mg/kg of dried mulberry leaf. The symptoms on silkworms were delayed, with blackening of the head plate and of the whole body, and a transparent body wall with light brown spots. Ecdysis did not always occur.

62083 **APTIC NO. 82359**

Tsunetoshi, Yoshizo, Masao Saita, Masayuki Yamashiro, Genichi Hirai, Makio Ando, and Kinya Okano

THE INFLUENCE OF ATMOSPHERIC SULFUR OXIDE CONTENT ON PREVALENCE OF CHRONIC BRONCHITIS AND GROWTH RATE OF PLANTS WITHIN THE INDUSTRIAL AREA LOCATING ALONG THE NORTHERN COAST OF OSAKA BAY. *Preprint, Science Council of Japan, p. 55, 1975. (Presented at the International Congress of Scientists on the Human Environment, Kyoto, Japan, Nov. 17-26, 1975.)*

The industrial areas of northwestern Osaka and southern Amagasaki along the northern coast of Osaka Bay have the highest prevalence of bronchitis in Japan. The prevalence of bronchitis almost parallels the content of sulfur oxide in the atmosphere from 1970 to 1973, according to an epidemiological survey. The growth rate of various plant species and the sulfur content of their leaves in Osaka and Amagasaki was examined. The growth rate was inversely proportional and the sulfur content directly proportional to the atmospheric sulfur oxide content. The high sulfur oxide content in the atmosphere of the northern coast of Osaka Bay might cause chronic bronchitis and inhibit the growth rate of plants.

62084 **APTIC NO. 83224**

Ulrich, B.

ENVIRONMENTAL INFLUENCES ON THE NUTRIENT CYCLE OF A BEECH FOREST ON ACID SOIL. *(Die Umweltbeeinflussung des Naehrstoffhaushaltes eines bodensauren Buchenwaldes). Text in German. Forstwiss. Centrablatt, 94(6):280-287, 1975. 14 refs.*

Rain input, the filtering effect of the forest on air pollution, the percolation output, the uptake, and the changes in soil contents are discussed. The hydrogen ion balance showed the acidification pressure exerted on soil and the contribution of sulfur dioxide (75%) and litter decomposition (25%). Eighty-five% of the hydrogen ion input was buffered by mineral soil; thus, losses of aluminum, manganese, calcium, magnesium, and sodium occurred. Annual losses correspond to 1% of the clay and feldspar content of the upper 20 cm of soil. There are indications that due to the losses, Mg will become a growth limiting factor in coming decades. Certain features of the A subscript eh horizon and A subscript he horizon due to acid rains in the last decades are described. The nitrogen input from air accounts for 40% of the uptake and has great ecological significance. From this input, 50% is stored in the stand, and 25% in the soil. Liming is suggested to compensate for soil acidification.

62085 **APTIC NO. 79396**

Wood, T. and F. H. Bormann

INCREASES IN FOLIAR LEACHING CAUSED BY ACIDIFICATION OF AN ARTIFICIAL MIST. *Ambio, 4(4):169-171, 1975. 14 refs.*

The effects of the acidity of an artificial mist on leaching from pinto bean and sugar maple leaves was investigated. Seedlings of both species were exposed to mists ranging in acidity from pH 5.0 to pH 2.3. Foliar leachate was collected and analyzed for sodium, potassium, magnesium, and calcium cation concentrations. Foliar losses of K, Mg, and Ca from the bean and maple seedlings increase as the acidity of the artificial mist is raised. At pH s of 3.0 and below, tissue damage, presumably caused by high hydrogen ion concentrations, contribute greatly to the increased cation losses found at these levels. Significant increases in leaching are measured at pH 3.3 and pH 4.0 where no tissue injury is observed. The increasing acidity of natural precipitation is accelerating foliar leaching of nutrient cations from exposed plants. Precipitation with pH s of 4.0 and below is currently falling on northern Europe and the northeastern United States. (Author abstract modified)

62086 **APTIC NO. 79583**

Yabuki, M., M. Aoki, and S. Imai

ECOLOGICAL INVESTIGATION OF PLANT ACTIVITY BY INFRA-RED COLOR AERIAL PHOTOGRAPHS PART 2. *(Sekigai color kokushashin ni yoru shokubutsu kassei no seitaichosa (2)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):462, Nov. 1975.*

The effects of auto exhaust on the activity of citrus trees in the vicinity of the opening of the Nibonzaka tunnel of the Tomei highspeed motorway were studied. The method was based on the linear relationship between total chlorophyll content (microgram/sq cm) and the ratio of transmitted light at 624 and that at 500 nm of positive film from aerial photographs. A map which shows the distribution of bi-band ratio with counter lines shows that the bi-band ratio of citrus trees near the opening of the tunnel is less than that of citrus trees grown in places remote from the opening, and that the area with a low bi-band ratio of citrus trees (ratio less than 0.1) showed a fan-like shape with the opening as the rivet of the fan. It was presumed that photosynthetic activity of citrus tree near the tunnel-opening was reduced to 60-70% that of normal trees.

62087 **APTIC NO. 80085**

Yamamoto, T. and Y. Suketa

ENVIRONMENTAL EVALUATION OF AIR POLLUTION DUE TO FLUORIDE IN THE AIR BY PLANT INDICATORS. *(Shokubutsu shihyo ni yoru kichu fukkabutsu osen no kankyo hyoka). Text in Japanese. Preprint, Japan Pharmaceutical Assoc., Tokyo, p. 3-6, 1975. (Presented at the Environment-Polluting Substances and their Toxicoloty Symposium, 2nd, Gifu, Japan, Oct. 27-28, 1975.)*

Hydrogen fluoride is detectable by plant damage even at ppb levels. Hydrogen fluoride in waste gas invades the plant body through the plant stomata and is accumulated as fluorides in concentrations several times those accumulated naturally by the plant root. A large correlation coefficient between the accumulated fluoride in plant leaves and the distance from the source of fluorides was demonstrated in gladiolus and Citrus unshu. The method of sampling and analyzing fluorides in plant leaves, soil, air, and subterranean water is described.

62088 **APTIC NO. 82146**

Yamamoto, Takeo, Yasunobu Suketa, Eiichi Mikami, and Yoshimi Sato

ENVIRONMENTAL ESTIMATION OF POLLUTION BY ATMOSPHERIC FLUORIDE USING PLANT INDICATOR. (BIOLOGICAL STUDIES ON ENVIRONMENTAL POLLUTION BY FLUORIDE PART II). *Text in Japanese. Nippon Nogeikagaku Kaishi (J. Agr. Chem. Soc. Japan), 49(7):347-352, 1975. 18 refs.*

Leaves of gladiolus and mandarin orange were used as plant indicators for air pollution by fluoride. The fluoride accumulations of these leaves were associated with gaseous fluoride concentrations. An equation is proposed for the relationship between accumulation of fluoride in plant leaves and distance from the fluoride-emitting source. Particulate fluoride was also collected for 5 yr. Both physicochemical determinations and biological indicators are necessary for monitoring atmospheric fluoride. Particulate fluoride monitoring must be included. (Author abstract)

62089 **APTIC NO. 79972**

Yamazoe, F. and H. Mayumi

STUDIES ON THE METHODS OF IDENTIFICATION OF PLANT DAMAGE DUE TO AIR POLLUTION PART III. DISTRIBUTION AND STATES OF HARMFUL SUBSTANCES IN POLLUTED PLANT BODY. SUBPART 1. SULFUR DIOXIDE. SUBPART 2. HYDROGEN FLUORIDE. *(Taikiosen ni yoru shokubutsu higai no kanteiho ni kansuru kenkyu Part III. Osenshokubutsu tainai ni okeru yugai busshitsu no bunpu to keitai). Text in Japanese. Nogyo Gijutsu Kenkyu Hokoku B, no. 27:27-37, Sept. 1975.*

Rice plants, two species of salting greens, and soybean plants were exposed to sulfur dioxide at low concentrations, (0.25-0.75ppm) for 5-10 hr/day in the daytime for several days (total hours of exposure between 10 and 54), and the sulfur in the plant body was examined. Several plants, including tomato and Pinus densiflora, were exposed to radioactively labelled sulfur dioxide at 0.5 ppm for 5 hours, and the distribution of radioactive sulfur in the plant body was traced. The same experiments and absorption tests were carried out with hydrogen fluoride, radioactive hydrogen fluoride tracer, and sodium fluoride. The findings are summarized as follows: (1) Sulfur dioxide is absorbed from plant stomata, and the absorbed sulfur exists in a water-soluble state in the plant in decreasing concentrations in leaf-blades, petioles, stems and roots, and especially in large amounts in interveinal parts of the leaves. (2) The intake of sulfur into protein (sulfur-containing amino acids) was less via leaf-absorbed sulfur dioxide than via root-absorbed sulfate ion. Visible damage due to sulfur dioxide is described. The leaf-absorbed hydrogen fluoride was accumulated in the leaf apex and leaf-periphery, especially in leaves with vigorous physiological action. The root-absorbed fluorine translocated into aerial parts, especially into active parts; however, local differences of distribution were not so conspicuous as in the case of leaf-absorption.

62090 **APTIC NO. 79973**

Yamazoe, F. and H. Mayumi

STUDIES ON THE METHODS OF IDENTIFICATION OF PLANT DAMAGE DUE TO AIR POLLUTION PART II. ANALYSES AND IDENTIFICATIONS OF HARMFUL SUBSTANCES IN POLLUTED PLANTS. SUBPART 4. DETERMINATION OF FLUORINE BY ION-ELECTRODE METHOD. *(Taikiosen ni yoru shokubutsu higai no kanteiho ni kansuru kenkyu, II. Osenshokobutsu chu no yugaiseibun no bunseki kanteiho; 4. Ion-denkyoku ho ni yoru fusso no teiryo). Text in Japanese. Nogyo Gijutsu Kenkyu Hokoku B, no. 27:20-27, Sept. 1975. 20 refs.*

In order to examine in detail the ion-electrode method for the determination of fluorine in plants, which is simpler and more rapid than colorimetry, about 45 species of plants collected in polluted areas were analyzed. The ion selectivity of the ion electrode for cyanamide, silicic acid, and carbonic acid gave a positive error of more than 10%. for calcium, iron II, iron III, aluminum, chromium and magnesium there was a negative error of more than 10%. Fluorine should be distilled as fluorosilicic acid at about 140 C, with the addition of silver nitrate to repress the distillation of chlorine. In cases where plants contain more than 5% silica, the calcined ash should be alkali-melted to prevent the hold-up of fluorine by gel-form-silica. The standard solution is best prepared by neutralizing aqueous sodium fluorosilicate with dilute alkaline solution to a pH of 5 - 6, with a detection range of 0.01 - 1000 ppm of fluorine. It is necessary to carefully read the value of potential difference of the electrode at equilibrium. Fluorine in plants can be determined by the ion-electrode method with an accuracy and precision not less than for volumetric analysis with thorium nitrate or colorimetry with alizarin complex.

62091 **APTIC NO. 79974**

Yamazoe, F. and H. Mayumi

STUDIES ON THE METHODS OF IDENTIFICATION OF PLANT DAMAGE DUE TO AIR POLLUTION PART II. ANALYSES AND IDENTIFICATION OF HARMFUL SUBSTANCES IN POLLUTED PLANTS SUBPART 3. DETERMINATION OF FLUORINE BY ABSORBANCY WITH THE ALIZARIN COMPLEX REAGENT. *(Taiki osen ni yoru shokubutsu higai no kanteiho ni kansuru kenkyu, II. Osenshokubutsu chu no yugaiseibun no bunseki kanteiho; 3. Alizarin complexon shiyaku niyoru fusso no kyukokodo teiryo). Text in Japanese. Nogyo Gijutsu Kenkyu Hokoku B, no. 27:10-20, Sept. 1975. 38 refs.*

A method for measuring fluorine in plants, based on absorbancy by alizarin complex reagent is examined. The findings are summarized as follows: (1) In determining fluorine by absorbancy using ALFUSSON, a mixture of alizarin complex-lanthanante-buffer agent, absorption at 620 nm was appropriate. (2) When developing color in a 25 ml measuring flask, the calibration curve showed lineality until 50 microgram (2 ppm) of fluorine during the adding of 3 ml of ALFUSSON solution, making the determination possible. (3) The sensitizing effectiveness of the coexistence of acetone was noticeable; the addition of acetone of 10 ml was appropriate. (4) The absorbancy of the colored solution increases with time; however, it stabilizes after 1.5 hr, and so the determination should be done simultaneously with the standard after 1.5 hours have passed. (5) Because aluminum, iron, and phosphate interfere with the determination, after calcination with milk of lime the plant specimen should be steam distilled in the presence of perchlorate and the distillate should be neutralized with sodium hydroxide. (6) The present method is applicable to low contents, of fluorine. It is more accurate than the volumetric method using thorium nitrate, and especially useful in microdetermination of fluorine in damaged plants.

62092 **APTIC NO. 79975**

Yamazoe, F. and H. Mayumi

STUDIES ON THE METHODS OF IDENTIFICATION OF PLANT DAMAGE DUE TO AIR POLLUTION PART II. ANALYSES AND IDENTIFICATIONS OF HARMFUL SUBSTANCES IN POLLUTED PLANTS SUBPART 2. DETERMINATION OF WATER SOLUBLE SULFUR. *(Taikiosen ni yoru shokubutsu higai no kanteiho ni kansuru kenkyu; II. Osenshokubutsu chu no yugaiseibun no bunseki kanteiho; 2. Suiyosei io no teiryo). Text in Japanese. Nogyo Gijutsu Kenkyu Hokoku B, no. 27:7-10, Sept. 1975. 9 refs.*

The water-soluble sulfur in plants correlates better with damage to the plants by sulfur dioxide than other indicators. Methods for determining such sulfur were examined for plants such as rice, peanut, soya, taro, and mulberry. The results are summarized as follows: (1) The amount of water-soluble sulfur showed better correlation to the damage due to sulfur dioxide smoke than did the total sulfur content of the plant. (2) In cases when identification was difficult, especially for acute damage, the determination of water soluble sulfur makes the identification easier and more accurate. (3) In cases when both total sulfur content and water-soluble sulfur were higher than for a control group, there is chronic damage, and in cases when only the latter is higher than for a control, there is acute damages. (4) Generally, the method of weighing barium sulfate is preferable for the determination, because the other methods, such as colorimetry, are more complicated.

62093 **APTIC NO. 80067**

Yamazoe, F.

EFFECTS OF FLUORIDES ON PLANTS. *(Fukkabutsu ni yoru shokubutsu eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):206-209, Nov. 1975. 7 refs.*

Fluorine compounds known to be air pollutants, such as hydrogen fluoride and silicon tetrachloride, are highly poisonous to plants even at ppm - ppb levels. As solid microparticles, acidic sodium fluoride and cryolite cause problems by adhering to plant leaves and absorbing into plant bodies. Plants are classified by their susceptibility to hydrogen fluoride: gladiolus, apricot, buckwheat, turnip and Vaccinium vitis-idaea are most susceptible showing slight injury at less than 5 ppb for 7-9 days; maize, pepper, and dahlia are fairly susceptible, followed by azalea, rose, lilac, and alfalfa, then by oak and tomato. Gladiolus is used as an indicator plant. The exposure factor for one species was known. The symptoms of plants exposed to gaseous fluorine compounds are described in detail at various concentrations. The causal mechanism of the injuries due to fluorine compounds is described in detail, with the method of determining the fluorine content of plant parts.

62094 **APTIC NO. 84048**

Yamazoe, Fumio and Hirokazu Mayumi

DIAGNOSTIC TECHNIQUES FOR PLANTS AFFECTED BY AIR POLLUTANTS. *Nogyo Gijutsu Kenkyusho Hokoku (B), no. 27:51-53, Sept. 1975.*

Characteristic acute leaf damage following exposure to sulfur dioxide at concentrations greater than 0.5 ppm and to ozone at concentrations above 01. ppm is described. Water-soluble sulfur and total sulfur determination methods were studied. Spectrophotometric and ion-specific electrode determination of fluorine were studied. The mechanism of sulfur dioxide and fluorine absorption by plants was studied.

62095 **APTIC NO. 80079**

Yoshida, Y.

EXPERIMENTAL STUDY ON MULBERRY LEAF POISONING BY AIR POLLUTION DUE TO A FACTORY S EXHAUST. *(Nihon denshi garasu takatsuki kojo no sansokogai taisakushiken). Text in Japanese. Shiga Pref. Sericultural Exp. Stn. Proc., no. 32:93-97, 1975.*

The cause of pollution of mulberry leaves used for silkworm feed was found to be fluorine compounds in the exhaust of the Takatsuki glass factory. Exhaust cleaning apparatus was installed. The worms were studied again. In the spring of 1973 a slight increase of dead worms was seen in some areas around the factory without changes in growth, or the yield and quality of cocoons. In autumn of 1973, although there was no change in worm mortality, the infantile stage was delayed 15 hours and the adult stage accelerated 20 hours. No difference of fluorine concentration was found in leaves of several areas around the factory; in one area of elevated content, the standard of 30 ppm was not exceeded. Silkworm damage due to polluted mulberry leaves probably will not be repeated, provided the cleaning apparatus continues to operate satisfactorily.

62096 **APTIC NO. 79586**

Matsumaru, T., M. Morikawa, and Y. Matsuoka

RELATION BETWEEN THE CONCENTRATION OF HYDROGEN FLUORIDE IN AIR AND THE ABSORBANCE OF FLUORINE OF RICE PLANT. *(Taikichu fukkasuiso nodo to suito no fusso kyushuritsu to no kankei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):460, Nov. 1975.*

Groups of rice plants (variety koshihikari) grown in pots were exposed at their ear sprouting stage to hydrogen fluoride at average concentrations of 10.1, 22.2, 28.4, 32.8, 37.2, 37.2, 53.1, 71.9, 106.8 and 148.3 ppb for 7 hours (0900-1600) in a growth cabinet under natural light at 30 C and RH of 60%. The content of fluorine was lowest in undeveloped leaves, and highest in the second and third leaves. A linear correlation curve was obtained between the logarithm of the fluorine content of the second leaf (ppm) and the concentration of hydrogen fluoride (ppb) used for exposure, with a correlation coefficient of 0.9185.

62097 **APTIC NO. 79976**

DIRECTION OF COUNTERMEASURES OF AGRICULTURAL CROPS BY AIR POLLUTION. *(Taiki osen ni yoru nosakubutsu higai taisaku no hoko). Text in Japanese. Nogyo oyobi Engei (Agr. Hort.), 50(10):1201-1202, Oct. 1975.*

The importance of photochemical smog is emphasized in terms of the number of emergency alerts of photochemical smog in Japan in 1974 (288), and the plant damage occurring at 0.05 - 0.07 ppm of oxidant for 2 - 4 hours. The air pollutants which damage plants are oxidants, sulfur dioxide, nitrogen oxides, hydrocarbons, aromatic compounds, halogen compounds, dusts, smoke, and heavy metals such as cadmium. The economic loss due to plant damage represented by tobacco spot disease (which has a close connection to the concentration of oxidants) was recently estimated as 3 million dollars. The prevention of crop damage due to air pollution is the jurisdiction of the Environment Agency. Environmental standards have already been established for sulfur dioxide, carbon monoxide, floating particulates, nitrogen dioxide, and photochemical oxidant; for hydrocarbons, lead, and fluorine, compounds standards are yet to be established. Methods to protect plants from air pollution, including chemical protectants, have been developed, but no well developed general effort exists.

62098 **APTIC NO. 80068**

Div. of Environmental Pollution Control, Tokyo (Japan)

REPORT ON THE RESULTS OF SURVEY ON PLANTS AFFECTED BY AIR POLLUTION IN OTA WARD. *(Ota-ku shokubutsu eikyo chosa hokokusho). Text in Japanese. 130p., May 1975.*

The growth 5 species of young trees (Zelkova serrata, Populus nigra, Ginkgo biloba, Ligustrum japonicum, and Quercus myrisifolia) in 8 public parks selected in Ota Ward in June 1972 was traced for 3 years. The delayed response of trees to air pollution was studied with a survey of Scarlet O Hara variety of Morning glory in 1973. Except for the poor growth of trees planted in reclaimed park grounds, the amount of pollution of leaves of Z.s. paralleled the degree of leaf damage of morning glory, and the vigor of Z.s. varied with the amount of deposited pollution and degree of morning glory leaf damage.

62099 **APTIC NO. 83730**

Fukuoka Environmental Research Center

RESULTS OF INVESTIGATION ON PLANT DAMAGES DUE TO FLUORINE. *(Fusso ni yoru shokubutsu higai kankei chosa). Text in Japanese. Fukuoka-ken Eisei Kogai Senta Nenpo (Ann. Rep. Fukuoka Environ. Res. Center), vol. 1973:34, March 1975.*

Rice plant withering occurred around a pritt manufacturing factory in July 1973. The fluorine content of the leaves and of the exhaust in the stack of the factory were determined. Although the fluorine content of the exhaust was 0.26 ppm, less than the emission standard, a considerable accumulation of fluorine was found in the rice leaves (34.7 and 352.0 ppm in the upper and lower part of the rice plant grown in a field 200 m distant from the factory, and 56.7 and 228.0 ppm in rice plants grown in a field 350 m from the factory, as compared to 8.9 and 12.4 ppm in a control rice plant). A higher value of fluorine was found in an auto-recorder near an aluminum factory. A determination of fluorine was carried out in leaves of Firmiana platanifolia, chrysanthemum, and salix grown 1000 m from the factory; however, the amount of fluorine (42.3 - 168 ppm) was not much higher than for a control (10 - 46.8 ppm).

62100 **APTIC NO. 83804**

INVESTIGATION OF AIR POLLUTION USING PLANTS, PART 1. *(Shokubutsu ni yoru taikiosen chosa, 1). Text in Japanese. Saitama-ken Kogai Senta Nenpo (Annu. Rept. Saitama Pref. Environ. Pollut. Res. Cent.), no. 2:86-91, 1975.*

Plant damage was high due to photochemical smog in Saitama Prefecture in 1972. Morning glory, cockscomb, and Welsh onion were used as indicators in 1974, and oxidant concentrations were measured. Morning glory was the best indicator; cockscomb and Welsh onion were lower in sensitivity than morning glory and slower in regenerating leaves. The heavenly-blue variety of morning glory was most sensitive; however, its short life span means that longer-term investigation is not possible. Because of the lower sensitivity of trees, compared to herbs, trees should be utilized for investigation of long-term, cumulative damage. There may be a correlation between the degree of plant damage and the oxidant concentration; however, several factors, such as topographical microclimate and the growth state of plant indicators, affect the correlation.

62101 **APTIC NO. 83849**

DAMAGE DUE TO AIR POLLUTION AND ITS COUNTERMEASURE PART 2. DAMAGE OF AGRICULTURAL AND FORESTRY CROPS. *(Taikiosen ni kakawaru higai to taisaku, 2. Noringyo ni taisuru higai). Text in Japanese. In: Chiba Prefectural Environmental White Paper (1975), p. 335-341, 1975.*

Incidents of crop damage due to air pollution in Chiba Prefecture (number due to smog in parentheses) numbered 4(1), 9(7), 12(7), 29(25), 30(17), 13(8) and 7(3), in 1968, 1969, 1970, 1971, 1972, and 1973 and 1974, respectively. The damage has occurred around the Keiyo coastal industrial area since 1965. Cases increased until 1972 due mainly to sulfur dioxide and fluorine acutely affecting pears and paddy rice. Acute damage has been prevented by treating exhausts. However, chronic low-concentration pollution and photochemical smog still damage taro, Welsh onion, and maize. One of the causes of damage to red pine and cryptomeria in these industrial areas is thought to be air pollution. Polyvinyl chloride film covering vinyl greenhouses after dust fall resulted in reduced illumination, and thus growth inhibition and poor warming.

62102 **APTIC NO. 84527**

RESULTS OF DAMAGE OF MULBERRY FIELDS BY SMOKE AND SOOT. *(Baien ni motozuku soen no higaichosa). Text in Japanese. Gifu-ken Kogai Kenkyusho Nenpo. (Ann. Rep Gifu Inst. Environ. Pollut.), no.2:35, 1975.*

Damage to mulberry fields in August 1971 in Kani County and in September 1971 in Ena City due to smoke and soot from potteries was investigated. Measurement of fluorine in mulberry leaves of trees grown near the potteries and in raw materials used in the potteries was carried out. The fluorine content of the raw materials ranged from 9.2 to 24.7 mg/100 g of sample. The damage to silkworms and mulberry trees was most severe around the pottery in which no exhaust treating apparatus was installed. The content of fluorine in mulberry leaves around the pottery ranged from 10.0-15.8 mg/100 g dry weight as compared to 4.4 mg/100 g for the control. When silkworms were fed with fluorine-containing mulberry leaves, it was found that leaves containing more than 100 ppm of fluorine gave some symptoms of intoxication.

62103 **APTIC NO. 84699**

Air Pollution Div., Kanto Regional Office of Promoting Countermeasures Against Environmental Pollution (Japan)

REPORT ON THE SURVEY ON THE EFFECTS OF PHOTOCHEMICAL SMOG ON PLANTS (1974). *(Kokagaku smog ni yoru shokubutsu eikyo chosa hokokusho). Text in Japanese. 51p., March 1975. 7 refs.*

A survey on the effects of photochemical smog on plants was carried out in July and August, 1974. Each survey was begun 2 days after high concentrations of oxidant occurred continuously for more than 2 days. The effects on plants were surveyed at 78 places distributed as evenly as possible in the Kanto region. Plant species were taro, maize, Welsh onion, peanut, soybean, spinach, Chinese cabbage, Beta vulgaris, turnip, Japanese radish, morning glory and others. Plant damage is described in detail, giving the position, symptoms, color of spots and forms of lesion, by species, with photographs. Species which showed peroxyacetyl nitrate-type lesions included lettuce, kidney bean, and spinach. The damage is described in detail by prefecture, species, frequency, and degree of damage. The distribution of the damage differed by species. Moderate damage to morning glory covered a wider area from Southern to Northern Kanto. Plant susceptibility to oxidant was, in descending order, taro, morning glory, maize, and peanut. The degree of damage was best represented by average leaf area damaged. A direct correspondence was found between the distribution of plant damage and the state of pollution by oxidants. Other surveys gave conflicting evidence.

1974

62104 **APTIC NO. 84654**

Ando, M.

THE ABILITY OF TREE LEAF SURFACES TO CATCH AIR POLLUTANTS. *(Jumoku [illegible] yomen osenbusshitsu hosoku no). Text in Japanese. Japan Forestry Society, Jap. Soc. For. Proc., 85th Annu. Meet., 1974, p. 293-295.*

The ability of plants to remove air pollutants was studied, by surveying the accumulated amounts of pollutants on tree leaves in the course of a year and the integrated amount of pollutants washed-out by rain water. The tree species were chosen from those planted in parks and a botanical garden in Osaka and Kono in Osaka Prefecture. It was found that the pollutant removing ability differed considerably between species, probably due to the difference of leaf-surface structure, the angle of attachment to the tree, and the length of the petiole. There were differences in the amount of calcinated residue and the amount of calcination loss of the matter caught on the leaf surface. No correlation existed between pollutant retaining ability and the resistance of species to air pollution. It was also found that the amount of pollutants caught on the leaf surface showed a correlation to the amount of falling dust, suggesting a usefulness as an index of falling dust. The efficiency of plant leaves for capturing air pollutants was estimated at 30-45% of the settling dust.

62105 **APTIC NO. 80326**

Arvik, John H. and Robert L. Zimdahl

BARRIERS TO THE FOLIAR UPTAKE OF LEAD. *J. Environ. Quality, 3(4):369-373, Oct.-Dec. 1974. 32 refs.*

Cuticles of leaves and fruits were studied to determine the ability of these structures and their waxes to prevent movement of Pb into the plant. Only extremely small amounts of Pb penetrates the cuticles, even after extended exposure to solutions containing 100 ppm Pb. Removal of the waxes permits increased penetration of some cuticles, and penetration is more related to species of plant than to thickness of the cuticle. Living plants were challenged by aerosols of lead bromochloride in an exposure chamber containing 1 microgram/sq cm PbClBr. Virtually all of the Pb added to plants in this manner can be removed by a chloroform rinse or mild acid wash. The Pb remains as a topical coating on the foliage. No significant amount of Pb is found in roots, fruits, or new shoot growth following exposure to Pb aerosols. (Author abstract modified)

62106 **APTIC NO. 83652**

Asakawa, F., T. Imai, and S. Kusaka

RELATION BETWEEN THE DEGREE OF OZONE DAMAGE OF PLANTS, AND CONCENTRATION AND EXPOSURE TIME OF OZONE, AND THE EFFECT OF OZONE EXPOSURE ON SUGARS. *(Shokubutsu no ozone shogaido to nodo, bakurojikan no kankei oyobi toshitsu e no eikyo). Text in Japanese. Japan. Soc. Soil Sci. Manure Annu. Meet., 20th, 1974, p. 117.*

Tomato plants in an exposure chamber were exposed to ozone at 0.1 ppm for 10 hr, 0.2 ppm for 5 hr, 0.5 ppm for 2 hr, and 1.0 ppm for 1 hr, and, in other experiments, to ozone at 0.1 or 0.2 ppm for 5, 10, 15, 20 and 25 hr. Damage symptoms included dark brown and splashed-pattern spots at lower concentrations, and greyish discoloration over the leaf blade along the veins at higher concentrations. The susceptibility to ozone was highest in the vigorously growing leaves of the middle position. The degree of damage was apparently higher for short exposure at high concentrations than for long exposure at low concentrations, suggesting the ability of ozone to cause much damage by a slight change of concentration. A tendency toward an increase of sugar reducing and starch reducing activity was observed with higher concentrations of ozone, seemingly in connection with the increase of visible damage. In the early stage of ozone exposure, when no visible damage occurred, some decline was found to sugar reducing activity. Total chlorophyll, and chlorophyll a and b decreased after exposure to ozone.

62107 **APTIC NO. 79966**

Hirai, Gen-ichi

SOME OBSERVATIONS ON PLANT GROWTH IN RELATION TO AIR POLLUTION. *Osaka Kyoiku Daigaku Kiyo (Memoirs Osaka Kyoiku Univ.), 23(3):9-15, 1974. 7 refs.*

Plant growth and tissue sulfur content for rice plants and 3 species of tree at 3 sites in Amagasaki, 1 site at Osaka bay, and 1 site in Ikoda in Osaka Prefecture were assessed and compared to ambient sulfur dioxide measurements. Despite individual differences, there was a tendency for less growth in areas of higher ambient SO2 concentrations. This was observed for the photosynthetic organs of rice plants in particular.

62108 **APTIC NO. 84049**

Hirata, H., H. Takenaga, and M. Homma

POLLUTION OF DRYLAND RICE PLANTS BY HEAVY METALS IN ANNAKA AREA, GUMMA PREFECTURE. *(Gummaken Annaka chiku ni okeru rikuto no jukinzoku osen). Text in Japanese. Japan. Soc. Soil Sci. Manure Annu. Meet., 20th, 1974, p. 119.*

Dry land rice plants were grown in pots or bottomless earthen pipes in 4 fields (150 m S, 250 m SW, 400 m SSW and 600 m E of a metal refinery in the Annaka area, Gumma Prefecture). The growth state of rice plants was normal but early severe chlorosis of the leaves, short stems, hypertillering and open tillering was noticed. The cadmium contents of brown rice from the open field and from pots or pipes were 1.1-40 and 0.10-0.45 ppm, respectively, showing that even brown rice harvested from originally non-polluted soil contained a certain amount of cadmium. The amount of cadmium dust fall at 2 m above the soil surface during the growing season was 0.6-1.5 kg/sq km/month, corresponding to an increase of cadmium content of the surface soil (2 cm in depth) of 0.1-0.3 ppm. Just after harvest, the surface soil of the pipe contained 2-4 ppm of cadmium; the amount could not be explained by dust fall alone, suggesting contamination from a source near the pipe. No cadmium contamination was found in the lower soil in the pipe. The distribution of cadmium in rice plants in open fields was far greater in the stem than in the leaves and fulls; however, in rice plants, grown in pots or pipes, it was far higher in the leaves and the fulls than in the stems. These facts show that the cadmium contamination of brown rice grain was due to direct pollution of the leaves and the fulls.

62109 **APTIC NO. 84378**

Hodgson, Richard H., Kendall E. Dusbabek, and Barry L. Hoffer

DIPHENAMID METABOLISM IN TOMATO: TIME COURSE OF AN OZONE FUMIGATION EFFECT. *Weed Sci., 22(3):205-210, May 1974. 10 refs.*

The metabolic time course of the herbicide diphenamid (N,N-dimethyl-2,2-diphenylacetamide) in tomato plants exposed to ozone fumigation (30 pphm) was altered. About 83% of the herbicide was metabolized in fumigated plants after 2 days as compared to 70% for control plants. Less glucoside conjugate was present in fumigated plants 2-4 days after treatment, and the gentiobioside conjugate increased rapidly in fumigated plants after 0.5 days as compared with increases in control plants only after 2 days. (Author abstract modified)

62110 **APTIC NO. 83696**

Imamura, Saboro, Hideo Okino, and Ikuo Inagaki

DAMAGE OF CABBAGE DUE TO THE DUST FROM A THERMAL POWER STATION. *(Karyoku hatsudensho fungin ni yoru kanran no higai). Text in Japanese. Aichi-ken Nogyo Sogo Shikenjo Kenkyu Hokoku (Rept. Stud. Aichi Prefect. Gen. Agric. Exp. Stn.), no. 6:102-107, Oct. 1974. 8 refs.*

Cabbage leaf damage consisting of black spots occurred in Jan. 1973 in a wide area in Atsumi-cho, Aichi Prefecture. The black spots occurred only on the surface of the head, in ring-form 1.0-1.5 mm in diameter, consisting of two kinds: dark purple-dark green rings with a pale brown inner part having cracks and scale; and those without cracks. The crackless spots showed severe contraction with minute dust in the center part, and the cracked spots had lost epidermal and palisade tissues and showed a honeycomb structure. The spots occurred mainly downwind of a thermal power station; the damage was more slight, as distance from the station increased. When the dust of the station was dissolved in water and diluted to 2% the solution contained 60-70% ammonium sulfate, vanadium, and nickel with a pH of 1.8. When the dust was spread on cabbage, lettuce, Chinese cabbage, Cehnopodium album, and Erigeron bonariensis, they developed spots (especially the cabbage) almost the same as those occurring in a field near a power station.

62111 **APTIC NO. 84658**

Ishii, S. and T. Inoue

SEED PRODUCTION OF ZELKOVA SERRATA AND AIR POLLUTION. *(Keyaki no shushi seisan to taiki osen no kankei ni tsuite). Text in Japanese. Japan Forestry Society, Jap. Soc. For. Proc. 85th Annu. Meet., 1974, p. 301-302.*

The distribution of fallen twigs of Zelkova serrata with 0, 1, 2, and 3 or more fruits was investigated in 13 places surrounding the center of the Tokyo Metropolis. In the Metropolitan center and places where the sulfur dioxide content of air is high, 90% of such twigs had no fruits. In places moderately polluted by aerial SO2, 50% of such twigs had no fruit. In places 40 km away from the Center, 26-32% of such twigs had no fruit and in places where the air was most clear, 95% of the twigs had fruit(s). As the sulfur content of leaves of the mother tree increased, the twigs (fallen) without fruit increased. Apparently, there is some effect of SO2 on the fruit forming of Z. serrata which wait future elucidation.

62112 **APTIC NO. 84686**

Kanai, H. and T. Arai

ALTERNATION OF VEGETATION IN THE SMOKE-DAMAGED FORESTS AND JUDGEMENT OF APPROPRIATE PLACES TO PLANT. *(Engai atochi ni okeru shokusei no henka to tekichi hantei). Text in Japanese. Maebashi Eirinkyoku Ringyo Gijutsu Kenkyu Shoroku (Forestry Technological Studies, Maebashi Regional Forestry Office), no. 19:13-15, 1972-1974.*

There are 4 sulfur mines in the jurisdiction of the Maebashi Regional Forestry Office, and their exhaust, containing high concentrations of sulfur dioxide, has damaged the forest on a fairly large scale. A detailed survey was carried out in August 1972 on the vegetation of one such damaged forest. According to the results of the survey, the historical alteration of vegetation due to the smoke (sulfur dioxide) was a progression of Fagus crenata-Quercus mongolica-Sasa kurilensis in a non-polluted forest, Carex oxyandra-Sorbus alnifolia-Malus sieboldic in a slightly damaged forest, Carex oxyandra-Quercus mongolica var. grosseserrata in a moderately damaged forest, and Carex oxyandra-Vaccinium uliginosum in a severely damaged forest. Briefly, as the damage was greater, the disappearance of tall trees and the appearance of herbaceous plants resulted. It was also found that pH of soil was lower as the damage was greater.

62113 **APTIC NO. 80148**

Karnosky, David F. and Gerald R. Stairs

THE EFFECTS OF SO2 ON IN VITRO FOREST TREE POLLEN GERMINATION AND TUBE ELONGATION. *J. Environ. Quality, 3(4):406-409, Oct.-Dec. 1974. 25 refs.*

The effects of sulfur dioxide on in vitro pollen germination and tube elongation were examined for Populus deltoides, Pinus resinosa, Pinus nigra, and Picea pungens. Comparisons were made between pollen fumigated in a dry condition and then placed on the germinating media, and moist pollen fumigated while on the germinating media. Moist P. deltroides pollen germination is significantly reduced at SO2 concentrations of 0.75 ppm and above. The pollen tube elongation of P. deltoides is more sensitive to SO2 exposure; highly significant decreases in tube length occur at 0.30 ppm/4 hr. Tube elongation decreases linearly with increases in SO2 concentration. Frequent bursting of pollen tubes occurs at SO2 concentrations greater than or equal to 0.3 ppm/4 hr. Exposure to SO2 causes similar effects on pollen germination and tube elongation for P. resinosa, P. nigra, and P. pungens. A 4-hour exposure to 1.4 ppm SO2 severely restricts moist pollen germination and tube elongation of these three conifer species. A similar exposure to 10 ppm SO2 has no effect on dry pollen of the three species. Absorption of SO2 results in an acidification of the germination media. (Author abstract modified)

62114 **APTIC NO. 76297**

Kopp, C.

EFFECT OF AIR POLLUTION ON ANIMALS. *(Wirkung von Luftverunreinigung auf das Tier). Text in German. Praxis. Pneumol., vol. 28:818-822, 1974. 6 refs.*

Animals are exposed to air pollutants, such as fluorine, lead, arsenic, and zinc, primarily through the ingestion of contaminated plants and fodder, while pulmonary uptake is more or less negligible. The pulmonary uptake of fluorine and lead in cattle usually ranges from 1 to 2%. At a daily uptake of 1.2-1.5 g of fluorine in contaminated forage, cows showed yellowish-brown coloration and hypoplasia of the incisors, and slightly disturbed mobility. After 6 years, the fluorine content was 245-890 mg in tail vertebra, and up to 254 mg in teeth, relative to 100 g of ash. The general health status, performance, body weight, and fertility were normal throughout the experiment. Lead emitted by automobiles causes a high degree of contamination of plants near highways, while bushes have an efficient sheltering effect. The concentrations may be normal at distances of 100 to 200 m off the highway. Health damages due to lead in cattle are rated as rather improbable. The determination of the delta-aminolevulinic acid excretion in the urine is suitable for the diagnosis of lead poisoning only conditionally, partly due to the antagonistic effect of zinc.

62115 **APTIC NO. 81512**

Krivopishin, I. P. and Y. S. Isaev

THE EFFECT OF OZONE ON MICROORGANISMS. *(Deistvie ozona na mikroorganizmy). Tr. Vses. Nauchn. Issled. Tekhnol. Inst. Ptitsevod, no. 38:32-37, 1974. 47 refs. Translated from Russian, 12p.*

Laboratory experiments on the effect of ozone on microorganisms are reported along with a review of the literature on the subject. Ozone possesses a pronounced bactericidal effect at a concentration as low as 0.0001 mg/l of air. The effect of ozone on various species and forms of microorganisms is different, with influenza virus being more sensitive to ozone than staphylococcus, for example. Ozone at a concentration of 0.4 mg/l (contact time of 4 min) is capable of inactivating poliomyelitis virus. Ozone is also capable of destroying various species of mold fungi. The ozonizing of air in an egg storage area results in the depression of mold development on the shell of hens eggs when ozone concentrations of 0.004-0.006 mg/l are used. The effect of ozone on various forms of microflora is identical in its mechanism, leading to the destruction of the membranes and the surface protoplasm layer of cells.

62116 **APTIC NO. 84540**

Kuribayashi, S.

EFFECTS OF ETHYLENE ON MULBERRY TREES. *(Ethylene no kuwa ni oyobosu eikyo). Text in Japanese. Taiki Osen Nyusa (Air Pollution News), no. 82:1, 1974.*

Ethylene is exhausted when organic material burns incompletely. Even in very small amounts, ethylene causes hormonal injuries such as the retardation of elongation, and leaf-fall. Ethrel, which generates ethylene, is used to accelerate the leaf-fall of mulberry. The fallen leaves are a safe diet for silkworms.

62117 **APTIC NO. 72458**

Matsuoka, Y., T. Takasaki, M, M. Morikawa, T. Matsumaru, and T. Shiratori

THE CONFIRMATION OF VISIBLE SYMPTOMS OF RICE PLANTS DUE TO PHOTOCHEMICAL OXIDANT. *(Suito no kokagaku okishidanto ni your kashishojo no kakunin). Text in Japanese. Nihon Sakumotsu Gakkai Kiji (Proc. Crop Sci. Soc. Japan), Suppl. 2:193-194, Nov. 1974. (Presented at the Crop Science Society of Japan Annual Lecture Meeting, 158th, Hirosaki, Japan, Oct. 1-3, 1974, Paper 97.)*

In Chiba Prefecture, rice plants have been attacked by photochemical oxidant resulting in minute reddish-brown spots on leaves, the symptom resembling stifle disease. Survey and experiments showed that 1-2 days after high oxidant concentrations (0.1-0.15 ppm or more) the spots appeared, the appearance being clearer with longer duration of the polluted condition. The appearance was recognizable toward the tillering stage. The spots concentrate mainly on the third leaves from the top and consist of necrosis of the peripheral cells of stomata and neighboring cells, without involvement of any known pathogenic fungus or bacteria. These phenomena could be caused artificially by ozone exposure at 0.15 ppm for 2-3 hr. Rice plants grown in an environment with air cleaned by active charcoal were free from the spots

62118 **APTIC NO. 83189**

Miyake, Y., Y. Uno, N. Takanashi, and M. Aoki

ON THE DAMAGE OF TOBACCO LEAVES DUE TO SULFUROUS ACID GAS PART 2. THE CHANGE OF LEAF COMPONENTS DUE TO THE DAMAGE DUE TO THE GAS. *(Tabacco-ba no aryusan gas shogai nitsuite dia-2 ho. Gas shogai ni yoru yochu seibun no henka). Text in Japanese. Japan. Soc. Soil Sci. Manure Annu. Meet., 20th, 1974, p. 116, 1974.*

Potted tobacco plants (yellow variety Hicks 2) were continuously exposed for 60 days, beginning 30 days after transplanting, to sulfur dioxide at 0, 3, 10 and 30 pphm. After every 20 days of exposure the 10 leaves from the 13th to the 22nd position were examined and their contents of total sulfur, water-soluble sulfur, and sugar were determined. The dry weight of the leaves was lower as the concentration of sulfur dioxide was higher. The appearance of visible damage occurred after 5-6 day exposure at 30 pphm, after about 25 day at 10 pphm, and after 40 day exposure at 3 pphm. The absorption efficiency of the leaves (content of sulfur divided by gas concentration and days of exposure) was higher as gas concentration was lower, and the damage appeared when the absorption efficiency became less than a constant value. Total sulfur and water-soluble sulfur in the leaves were higher as the gas concentration was higher, and the ratio of water soluble sulfur to total sulfur was also higher as the gas concentration was higher. The content of starch and dextrin was lower as the gas concentration was higher, accompanied by a delay in the maturation of the leaves.

62119 **APTIC NO. 81393**

Moriya, K., T. Yabe, T. Watanuki, and F. Harada

STUDIES ON THE LOCAL EVALUATION OF AIR POLLUTION BY BIOLOGICAL INDICATORS: INDEX OF DIVERSITY OF INSECT SPECIES CAUGHT BY LIGHT TRAPS. *(Seibutsu shihyo ni yoru taiki osen no chiikiteki hyoka ni kansuru kenkyu: Yusatsuto ni hoshu sareta konchurui no tayosei shisu). Text in Japanese. Kanagawa-ken Eisei Kenkyusho Nenpo (Annu. Rep. Kanagawa Prefect. Public Health Lab.), no. 24:130-132, 1974.*

An approach to the problem of assessing the general local effects of air and/or environmental pollution using biological indicators (the comparison of the diversity of biological species between communities) is described. Along with damage to the environment, the number of species of living things is reduced by pollution, leaving many individuals from a small number of resistant species. A study of the species variety and number of moths caught by light traps installed at 23 - 25 places in 1973 and 1974 are described. The index of diversity was calculated according to Brillouin (1956). The distribution of the index coincided with the existing condition of the environment.

62120 **APTIC NO. 84583**

Nakajima, Y., Y. Ogiwara, S. Ogawa, and S. Kazue

STUDIES ON THE DAMAGE OF PLANTS DUE TO SMOKE. PART 7. STATE OF POLLUTION AND THE DISTANCE FROM THE POLLUTION SOURCE. *(Jumoke no engai ni kansuru kenkyu. VII. Osengen cara no kyori to osen jokyo). Text in Japanese. Jap. Soc. Forestry, Kyushu Branch Rept., no. 27, 2p., 1974.*

The leaves of 3 trees each of Cryptomeria japonica grown in 10 places in the direction of the prevailing wind and removed from the major pollution sources (Omura and Kitakyushu Cities) by at most 30 km were collected and divided into two groups, the first year leaves and the second year leaves. The concentration of sulfur dioxide in the air, and the sulfur content of the leaves were determined. Although it is expected that the concentration of sulfur dioxide (as sulfur trioxide, mg/day/100 sq cm) would decrease as the distance from the pollution source increased, the concentration became constant at 0.1-0.15 mg sulfur trioxide/day/100 sq cm, the value probably being the prevailing one throughout the whole area. The sulfur content of the leaves decreased gradually as the distance from the pollution source increased and showed a steady value of 0.05-0.08% in the non-polluted area. A correlation was recognized between the sulfur content of the leaves and the concentration of sulfur dioxide in the air.

62121 **APTIC NO. 81834**

Nash, Thomas H., III

LICHENS OF THE PAGE ENVIRONS AS POTENTIAL INDICATORS OF AIR POLLUTION. *J. Ariz. Acad. Sci., 1974:97-101, Oct. 1974. 13 refs.*

A survey of the lichen flora of the Page, Arizona environs was conducted to establish the nature of the lichen communities prior to the initial operation of the Navaho steam power plant. Altogether 147 lichen species in 37 genera were collected. The data are to be used as baseline information for plant indicator studies after the power plant begins operating. Most of the species are crustose, and it is thus anticipated than many of the species will tolerate the air pollution from the power plant. An annotated list of the species collected is presented.

62122 **APTIC NO. 79890**

Navara, Jan, Ivan Horvath, Ivan Hauskrecht, and Milan Kuleta

APPLICATION OF A PHYTOINDICATION METHOD FOR A SEMIQUANTITIVE EVALUATION OF POLLUTANT CONCENTRATION IN THE ATMOSPHERE AROUND BRATISLAVA. *(Semikvantitativne hodnotenie imisnej situacie fytoindikacnym sposobom v oblasti Bratislavy). Text in Slovak. Ochrana Ovzdusi, 6(7):89-96, July 1974. 23 refs.*

A correlation was sought between the measured amounts of sulfur dioxide in the atmosphere and the amount of sulfur contained in leaves of buckwheat and Canadian poplar in order to establish the applicability of phytoindication methods to evaluation of atmospheric pollution. The discernible changes in the sulfur absorbed by the leaves of these plants from the atmosphere are at a level which is about 100 times below the level specified as safe for human beings by the current air pollution laws. Hence, the phytoindication method based on these two plants can be used to predict dangerous levels of air pollution, provided that the sampling of leaves is rigidly controlled, i.e., the plants are exposed to the same climatic conditions. The most sensitive leaves of the Canadian poplar are the newest leaves, located at the bottom of the crown, around its perimeter. Measurements were performed in the vicinity of Bratislava and indicated that the method is also feasible in the presence of other strong pollutants in the air.

62123 **APTIC NO. 84687**

Nishimoto, T. and K. Fujita

STATE OF CADMIUM POLLUTION IN A FEW WOODED FIELDS. *(2.3 no rinya niokeru cadmium osen no jittai). Text in Japanese. Japan Forestry Society, Jap. Soc. For. Proc., 85th Annu. Meet., 1974, p. 308-309. 3 refs.*

The state of cadmium pollution of woodland plants by the smoke of a refinery was surveyed. The cadmium content of the bark and woody part of Quercus mongolica var. grosseserrata, of the edible part of a bracken plant, and of Petasites japonicus around a refinery was determined. The refinery has a history of causing environmental pollution by the sulfur dioxide in its exhaust as far back as 1902. The cadmium pollution was more severe in the plants grown nearer to the refinery, especially in the predominant wind direction. With the analytical data on the soil around the refinery, it was seen that the most highly polluted regions and plants were the soil-A layer, shrubs, herbs, and the bark of trees.

62124 **APTIC NO. 84657**

Ogiwara, M.

RESULTS OF SURVEY OF SCALE INSECTS IN AIR POLLUTED AREAS (I). *(Taikiosen chitai no kaigaramushi no jittai chosa. 1.). Text in Japanese. Japan Forestry Society, Jap. Soc. For. Proc., 85th Annu. Meet., 1974, p. 301-302.*

Since scale insects are known to increase the damage of trees caused by air pollution, the parasitic state of scale insects on trees was surveyed in Tokyo, Yokohama, and Kawasaki where air pollution has progressed and at several locations in Kanagawa, Yamanashi and Ibaraki Prefectures in 1972 and 1973. The results in cities were: except for a park where air pollution was most severe, the number of species was relatively small; generally, the density of parasitism did not show large differences; and in the suburbs the parasitic density was lower than in the cities, especially in places where the environmental conditions were considered to be better. In the three prefectures, the parasitic density in places remote from cities was very low. As for Doliaspis pini on pine trees, its parasitic density was high in the area where air pollution severely affected the pine trees and was low in the places where environmental conditions were good. Very low parasitic density was found in mountainous areas without air pollution.

62125 **APTIC NO. 84582**

Otani, A.

ON THE RESULTS OF EXPERIMENTAL EXPOSURE OF TREES TO SULFUR DIOXIDE. *(Jumoku no aryusan gas sesshoku shiken ni tsuite). Text in Japanese. Japan Society of Forestry, Japan Soc. For., Chuku Branch, Proc. 23rd Annu. Meet., 1974, p. 25-29. 6 refs.*

In order to obtain an index of air pollution in a city area, potted plants of height 70 cm of the species Cedrus deodara, Metasequoia glyptostroboides, Viburnum awabuki, Magnolia obovata (May 29 - June 30), Podocarpus macrophylla, Ginkgo bilboa, Cinnamomum camphora, Ilex rotunda, Acer pyenantham, elm (July 27-Aug. 30), Pinus thunbergii and P. densiflora, Cryptomeria japonica, Chamaecyparis obtusa, Nerium indicum, Ternstroenia japonica, Osmanthus fragrans var., auranticus, Quercus myrsinaefolia, and Q. phillyraeoides (Oct. 15-Nov. 28) were exposed to sulfur dioxide at 0.8 ppm in an air conditioned chamber at 24 (May-June), 27 (July-Aug.) and 26 (Oct.-Nov.) and relative humidity of 76-84%, 7.5 hr/day (from 0900 to 1630) for 24 hrs, except for P. densiflora (16 days). The species with lighter injury were C. japonica, C. obtusa, Q. myrsinaefolia and I. rotunda; the species with heavier injury were P. densiflora, G. bilboa, and C. deodara; and the species with individual differences included M. obovata. The species on which injury such as chlorosis appears earlier are G. bilboa, C. camphora, and I. rotunda, and the species on which necrosis appears earlier are G. bilboa, and C. camphora. The species on which symptoms did not appear are P. thunbergii, C. japonica, T. japonica, and O. fragrans. Injuries generally appeared on newly developed leaves, and the sulfur content of leaves increased conspicuously; however, the content of sulfur in twigs, trunks, and roots was the same as in controls.

62126 **APTIC NO. 80278**

Pell, Eva J.

THE IMPACT OF OZONE ON THE BIOENERGETICS OF PLANT SYSTEMS. *Am. Chem. Soc. Symp. Ser., no. 3:106-114, 1974. 22 refs.*

The impact of ozone on the bioenergetics of plant systems is discussed, with particular reference to experiments with pinto bean plants. Ozone exposure is capable of causing decreases in photosynthesis and both increases and decreases in respiration. Ozone also disturbs the bioenergetic status of mitochondria and chloroplasts. Intact pinto bean plants exposed to 0.30 microliter/l of ozone for 3 hr show significant increases in adenosine triphosphate and total adenylate content before visual symptoms appear. Variable physiological responses to ozone appear to be related to the stage of symptom development at the time of analysis and to the mode of ozone exposure (in vivo versus in vitro). (Author abstract modified)

62127 **APTIC NO. 83654**

Shinozaki, M. and M. Maeno

EFFECT OF PIPERONYL BUTOXIDE ON THE REDUCTION OF DAMAGE TO SPINACH DUE TO OZONE. *(Hourenso no ozonshogai keigen ni kansuru piperonyl butoxide no koka). Text in Japanese. Japan Soc. Soil Sci. Manure Annu. Meet., 20th, 1974, p. 118.*

The effect of piperonyl butoxide in reducing the ozone damage to tobacco plants was examined on spinach by leaf-spraying an 0.1% solution of it in an 0.2% alcohol solution with 0.03% of a surfactant. Ozone exposure, potassium fertilization, and nitrogen fertilization were varied, with or without piperonyl butoxide. After exposure to 20 pphm for 3 hr, sprayed spinach plants showed almost no damage. Spinach which had not been treated with piperonyl butoxide had 11.2 damaged leaves out of a total of 35 leaves of commercial value; that which had been treated had only 0.2 damaged leaves. The protective effect of piperonyl butoxide continued even after 5 days. Leaf treatment with the butoxide did not affect the growth of spinach or its absorption of potassium, nitrogen, calcium, or magnesium. The increase of potassium and nitrogen fertilization showed a weak preventive power against ozone damage.

62128 **APTIC NO. 84593**

Shinozaki, M.

SYMPTOMS OF PLANT INJURY DUE TO OXIDANT, AND PLANTS AS OXIDANT INDICATORS. *(Oxidant no shokubutsu higai shojo to shokubutsu no shihyosei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 10(10):1047-1053, 1974. 9 refs.*

The general symptoms of plant injury to leaves due to photochemical oxidant, such as chlorosis and necrosis preceded by oily immersion and followed by partial perforation or leaf fall are described. Plant damage is classified into two categories: ozone-type and peroxyacetyl nitrate-type. The specific features of symptoms and their development on vegetables are described in detail. The vegetables were divided into leaf, root and fruit vegetables, legumes, and others such as taro, potato, maize, tobacco, and morning glory. The susceptibility and resistance of plants to oxidants and the differences of susceptibility and resistance have been studied by exposure to measured oxidant doses.

62129 **APTIC NO. 72457**

Taniyama, T. and T. Watanabe

STUDIES ON CROP DAMAGES DUE TO GASES: PART 19, THE MEANING OF INDICATOR PLANTS TO AIR POLLUTION AND THEIR UTILIZATION. *(Sakumotsu no gasushogai ni kansuru kenkyu: Dai-19-ho, Taikiosen ni taisuru shihyo shokubutsu no igi to sono riyo). Text in Japanese. Nihon Sakumotsu Gakkai Kiji Proc. Crop Sci. Soc. Japan), Suppl. 2:185-186, Nov. 1974. (Presented at the Crop Science Society of Japan Annual Lecture Meeting, 158th, Hirosaki, Japan, Oct. 1-3, 1974.)*

In order to find plants more sensitive than rice to air pollution, Hosta rhodeifolia, gladiolus (friendship), buckwheat, black sesame and three varieties of morning-glory were cultivated and observed every 10 days from June to August 1973. The damages were classified as I - V (order of severity). The number of leaves at several orders of damage was represented by Ni. The damage to individual plants (%) was represented by the formula: % damage equals (Ns + 4/5N4 + 3/5 N3 + 2/5 N2 + 1/5 N1) times 1/Nt times 100, Nt being the summation from i equals 1 to i equals 5 of Ni. There is a close connection between the decrease of rice crop and the occurrence of chronic bronchitis and of bronchial asthma. A clear correlation was found between the % damages of gladiolus and Hosta

rhodeifolia. A special (not linear) relationship between the % damage of gladiolus and average concentration of sulfur trioxide (mg/sq dm/day) was found.

62130 **APTIC NO. 84581**

Taniyama, T. and T. Watanabe

MONITORING OF AIR POLLUTION BY INDICATOR PLANTS. *(Shihyo chokubutsu ni yoru taikiosen no kanshi). Text in Japanese. Crop Science Society of Japan, Crop Sci. Soc. Jap. Meet., 70th Tokai Branch, Japan, 1974, p. 31-35.*

The plants which are recognized to be highly susceptible to air pollution, such as Hosta species, gladiolus, buckwheat, sesame and three varieties of morning glory were sown or transplanted at 27 places 1 km to 40 km from the Yokkaichi industrial combination. According to the injuries to the plants, the rate of damage was higher in the places where the degree of air pollution was higher. Of the plants surveyed, the susceptibility is in the decreasing order of gladiolus, Hosta, buckwheat, sesame, and the three species of morning glory. Gladiolus showed especially high damage, more than 60%. A correlation of the rate of damage of individual plant species was found between gladiolus, Hosta, and buckwheat. Gladiolus, Hosta and buckwheat can be utilized as indicator plants in the Yokkaichi area.

62131 **APTIC NO. 80083**

Tominaga, Y. and T. Miyamoto

FLUORINE-POLLUTION OF PLANTS. *(Shokubutsu no fusso osen ni tsuite). Text in Japanese. Ibaraki-ken Kogai Gijutsu Center Nenpo (Annu. Rept. Environ. Pollut. Res. Center Ibaraki Pref.), no. 7:74-77, 1974.*

A survey of the fluorine content of plants and of the environment around a metal processing factory (A) and an aluminum-slug treating factory (B) is described. In the leaves of an indicator plant, gladiolus, the fluorine content was 59 ppm at (A) (compared to 31 ppm in a non-polluted area), with visible damage to the plants. In rice plants planted near factory (B), the fluorine content was 95 ppm with visible damage at the apex and periphery of the leaves (compared to 8 - 8 ppm in rice plants in a non-polluted area). The hydrogen fluoride concentration was below the detection limit of the automatic analyzer; however, the larger fluorine content in plants was probably due to the environmental accumulation of hydrogen fluoride. The fluorine content of the plants decreased with distance from the factory.

62132 **APTIC NO. 84689**

Yamaga, Y.

PRESENT STATE OF TREE DECLINE NEAR TOKYO. *(Tokyo fukin no okeru jumoku suita no jittai). Text in Japanese. Japan Forestry Society, Jap. Soc. For. Proc., 85th Annu. Meet., 1974, p. 295-297.*

The effect of urbanization on trees was studied using Cryptomeria japonica and Zelkova serrata grown in a radius of 100 km from the center of Tokyo. The result showed a severe decline of both trees within 30 km in every direction, a moderate decline between 30 and 60 km, and seemingly no decline beyond 60 km. The primary cause of the decline was presumed to be air pollution. Fungi, bacteria, and actinomycetes in soil in the circle were surveyed. Only a fungus was a tendency similar to the state of arboreal decline observed; that is, in the center a number showing a clear decline, with recovery to 20 km, then decline at 50-60 km, and again recovery to 80 km.

62133 **APTIC NO. 83851**

RESULTS OF SURVEY OF PLANT DAMAGE DUE TO FLUORINE. *(Fusso ni yoru shokubutsu higai kankei chosa). Text in Japanese. In: Annual Report of the Fukuoka Prefectural Center of Hygiene and Environmental Pollution (1973), p. 34, 1974.*

An incident of withering of paddy rice plants in the fields around a frit factory in July 1973 was investigated. The content of fluorine in the leaves of the plants and in the off-gas smoke and dust of the factory was determined. Although the stack content was 0.26 ppm, less than the standard, that in the leaves was as high as 34.7 (upper leaves) to 352 ppm (lower leaves) at 200 m from the factory and 56.7 (upper leaves) to 228.0 ppm (lower leaves) at 350 m from the factory, compared to 8.9 to 12.4 ppm 2000 m from the factory. On another occasion of high fluorine in Nov. 1973 around an aluminum refinery, the fluorine content of the leaves of plants nearby (Firmiano platanifolia, chrysanthemum, and fillow) was determined. Very small positive values were obtained: 42.3-75.6 ppm in F. p. 1000 m from the factory and 45.5 ppm 4000 m from the factory; 168 ppm in crysanthemum 1000 m from the factory and 10 ppm 4000 m from the factory; 46.8 ppm in willow 1000 m from the factory and 39.9 ppm 4000 m from the factory.

62134 **APTIC NO. 83856**

Div. of Environmental Sanitation, Shimane Prefectural Office

DAMAGE OF SILKWORM IN MASUDA CITY AND ITS COUNTERMEASURE. *(Masudashi Hanehara chiku ni okeru sanjihigai to sono taisaku). Text in Japanese. In: Environmental Pollution in Shimane Prefecture, p. 316-318, 1974.*

The occurrence of silkworm and mulberry damage in July 1974 in the Hanehara area of Masuda City was investigated. Mulberry leaves and the smoke of a ceramic factory nearby were studied. The fluorine content of mulberry leaves near the factory ranged from 11.7 to 33.3 ppm (dry matter); thus, the damage to silkworms was attributed to fluorine in the smoke of the factories. As a countermeasure, fluorine-removing equipment was put into operation in the factories in Jan. 1975.

1973

62135 **APTIC NO. 76454**

Barbour, Michael G.

CHEMISTRY AND COMMUNITY COMPOSITION. *Advan. Chem. Ser., no. 122:85-100, 1973. 49 refs. (Presented at the American Chemical Society, Division of Agricultural and Food Chemistry Meeting, 161st, Los Angeles, Calif., March 31-April 1, 1971.)*

Ecological studies concerned with the chemical interaction of various plant and animal organisms within a community are reviewed. The effect of natural chemicals on community composition is examined on three levels: producer, consumer, and decomposer. Topics discussed include: the importance of certain soil fungi to many higher plants, the effect of plant decomposition on soil pH, the adsorption of volatile plant oils by the soil, the inhibitory and stimulating effects of plant extracts on different strains of bacteria, the effect of plant compounds and decay products on saprophytic and parasitic fungi, the toxicity of volatile plant oils toward the germination and growth of surrounding annuals, the role of species-specific biochemical interactions in the association of forest species, and preferences of various insect groups for specific families of flowering plants.

62136 **APTIC NO. 79816**

Bonotto, S. and R. Kirchmann

LEAD EFFECTS ON THE MORPHOGENESIS OF THE UNICELLULAR MARINE ALGA ACETABULARIA. *Ann. Gembloux, 79(2):121-130, 1973. 26 refs.*

The effects of lead on the main morphogenetic processes of the unicellular marine alga Acetabularia mediterranea were studied. The algae were cultivated in a sterile medium. Algae were enucleated by cutting off the basal part of the stalk containing the nucleus. Lead nitrate was added in concentrations of 0, 10, 25, 50, and 100 mg/l. Nucleate or anucleate cells reacted to the toxic effects of lead after a few days and par-

tially recovered after 2 or 3 weeks. Cap growth occurred even at the higher concentrations of lead, although cap initiation was particularly sensitive to the action of chemical or physical agents. The ability of nucleate basal fragments to regenerate was not lost following lead treatment. Both nucleate and anucleate Acetabularia treated with Pb(NO3)2 frequently formed abnormal caps. Since the normal culture medium for Acetabularia contains relatively large amounts of sodium nitrate, it is unlikely that the observed conspicuous biological effects were due to the small addition of nitrate ion rather than the lead. Cap initiation, which is indispensable for reproduction, is clearly the most sensitive morphogenetic process in lead treated Acetabularia.

62137 **APTIC NO. 84015**

Danbayashi, K.

EFFECTS OF AIR POLLUTION ON TREES, AND COUNTERMEASURES PART 2. RELATION BETWEEN AIR POLLUTION AND SULFUR CONTENT OF TREE LEAVES IN AMAGASAKI CITY. *(Taiki osen no jumoku ni oyobosu eikyo to so no taisaku. Part 2. Amagasaki-shi ni okeru taikiosen to jumoku no han ni fukumareru io to no kankei). Text in Japanese. In: Report on Research and A Survey Promoting Environmental Greening, p. 1-21, 1973. 10 refs.*

The area of Amagaski where air pollution was highest in Hyogo Prefecture was divided into 5 subareas on the degree of air pollution, and leaves of the trees growing therein was taken in 1969 and 1972 to be analyzed for sulfur to see the relationship between the degree of pollution and the sulfur content of the leaves. In 1969, there was a tendency of increasing sulfur content as the degree of air pollution became higher. In 1972, although the same tendency was found, the general sulfur content was lower because of the lowering of sulfur dioxide content in the air. The tree species in which sulfur content was higher were Nerium indicum, Viburnum awabyjum, Netasequoia glyptostroboides, Salix babylonica, and Ginkgo biloba; those with smaller sulfur content were Jumperus chinensis, Prunus jedoensis, and Cedrus deodara. The tree species which showed a larger intake of sulfur were G.b., N.i., and P.y.; those which showed a smaller intake were V.a., C.d., and M.g., (it was generally greater in deciduous trees).

62138 **APTIC NO. 84016**

Danbayashi, K.

EFFECTS OF AIR POLLUTION ON TREES, AND COUNTERMEASURES PART 3. DAMAGE PREVENTING EFFECT OF TREATING LEAF SURFACES WITH A COVERING AGENT. *(Taikiosen no jumoku ni oyobosu eikyo to so no taisaku Part 3. Yomenhifukuzai shori ni yoru jumoku higai no bojo koka). Text in Japanese. In: Report on Research and A Survey Promoting Environmental Greening, p. 22-39, 1973. 10 refs.*

Protective covering agents were sprayed on trees such as Ginkgo biloba, Sapium sebiferum, quercus myrsimaetolis, a kind of acer, and Zelkova serrata, and the effect was observed for 3 years from 1970. The most effective agent was an evaporation suppressing agent, followed by a fungicide (N-tetra-chloroethyltiotetrahydrophythalimide). Another fungicide, mono-fluoroacetoamide, and phenylacetic acid, had an unstable effect, including phototoxicity. The tree species showing effective damage control were G.l., followed by Z.s. The effect of covering agents was greater as the concentration of sulfur trioxide in air increased.

62139 **APTIC NO. 76452**

Feder, William A.

CUMULATIVE EFFECTS OF CHRONIC EXPOSURE OF PLANTS TO LOW LEVELS OF AIR POLLUTANTS. *Advan. Chem. Ser., no. 122:21-30, 1973. 49 refs. (Presented at the American Chemical Society, Division of Agricultural and Food Chemistry Meeting, 161st, Los Angeles, Calif., March 31-April 1, 1971.)*

Studies involving the chronic exposure of green plants to low levels of air pollution are reviewed. The cumulative effects of fluorides, sulfur oxides, ozone, nitrogen oxides, peroxyacetyl nitrate, and photochemical oxidants are considered. Plants exposed to 10 ppm ozone over a long period of time show reduced growth, leaf size, stem length, root weight, and flower production, as well as a delay in the onset of floral initiation. These effects are expressed in terms of the depression of total plant growth or population growth, as distinguished from acute effects which generally cause injury to plants but do not necessarily effect total growth or productivity. Evidence is accumulating which indicates that plants may exhibit depressed growth and yield with or without overt expression of injury symptoms. There appears to be a relationship between the dose- response curves describing acute symptom expression and those which can be used to express suppression of growth and yield. (Author abstract modified)

62140 **APTIC NO. 81951**

Fischer, Karl, Detlef Kramer, and Hubert Ziegler

ELECTRON MICROSCOPIC INVESTIGATIONS OF LEAVES BY VICIA FABA EXPOSED TO SO2. I. INVESTIGATIONS OF CHLOROPLASTS WITH ACUTE INJURY. *(Elektronenmikroskopische Untersuchungen SO2-begaster Blaetter von Vicia faba. I. Beobachtungen an Chloroplasten mit akuter Schaedigung). Text in German. Protoplasma, 76(1): 83-96, 1973. 17 refs.*

Leaves of Vicia faba, still attached to the plant, were individually exposed to sulfur dioxide, under constant physical conditions. The changes in the chloroplasts of the spongy parenchyma of acute damaged leaves were examined. The first modifications in the chloroplasts were the granulation of the stroma and the swelling of the stromathylakoids and granathylakoids. Subsequently the volume of the chloroplasts increased considerably. It was not possible to obtain statistically significant differences in diameter or number of osmiophilic plastoglobuli. The plastid membrane dissolved in the final stage of acute damage and then the swelling of the thylakoids disappeared. The thylakoid membranes remained intact for a remarkably long time, but then showed very clear symptoms of decomposition. The electron density increased because the chloroplasts had begun to shrink in the final phase of damage.

62141 **APTIC NO. 81775**

Giles, F. E., S. G. Middleton, and J. G. Grau

EVIDENCE FOR THE ACCUMULATION OF ATMOSPHERIC LEAD BY INSECTS IN AREAS OF HIGH TRAFFIC DENSITY. *Environ. Entomol., 2(2):299-300, April 1973. 6 refs.*

Lead assays were performed on plants and insects found near a busy urban freeway to determine the extent of lead retention resulting for exposure to automobile exhaust. Significantly higher lead concentrations were found in wild carrot (Daucus Carota L.) and evening primrose (Oenothera biennis L) plants growing near the freeway as opposed to plants obtained from a control area. The lead levels for plants gorwing near the freeway were 9.42 and 15.66 micrograms/g tissue, respectively, as compared to 2.99 and 4.28 micrograms/g, respectively, for control plants. Among insects collected, European mantid (Mantis religiosa L.) exhibited the highest lead retention in relation to controls. Imagos in the breeding stage showed a lead concentration of 14.80 micrograms/g tissue in the freeway area as compared to a control value of 1.94 micrograms/g of lead.

62142 **APTIC NO. 76450**

Harding, James

COLONIZING GENETIC POPULATIONS AS UNITS OF REGULATED CHANGE. *Advan. Chem. Ser., no. 122:63-74, 1973. 12 refs. (Presented at the American Chemical Society, Division of Agricultural and Food Chemistry Meeting, 161st, Los Angeles, Calif., March 31-April 1, 1971.)*

The variation at four genetic loci in 29 populations of Lupinus succulentus (Fabaceae), an annual California native which colonizes abundantly near roadsides, was studied to determine if environmental disturbances exert deleterious effects on the plant s genetic structure. A mathematical model was developed; and estimators were derived for the parameters gene frequency, heterozygote frequency, rate of cross-fertilization, and coefficient of inbreeding. Variation was nearly always present for the locus affecting seed pigmentation, whereas variation was generally absent for the loci affecting flower pigmentation. Variation was not reduced in populations from recently colonized sites. Rates of cross-fertilization ranged from zero to nearly 100% with a mean near 0.50. Coefficients of inbreeding varied from zero to 0.80 with a mean near 0.40. The results do not suggest that man s disturbance of the environment exerts any deleterious effect on the genetic structure of Lupinus succulentus. (Author abstract modified)

62143 **APTIC NO. 81959**

Kawecka, Amelia

CHANGES OF THE LEAVES OF THE SCOTS PINE (PINUS SILVESTRIS L.) DUE TO THE POLLUTION OF THE AIR WITH NITROGEN COMPOUNDS. *Ekol. Pol., 21(7):1-16, 1973. 17 refs.*

Damage to pine trees was investigated in forests near a nitrogen fertilizer plan. Samples of needles were collected, and the overall length and the percentage which was necrotic were recorded. The degree of response to pollution varies from tree to tree. Three year from the first occurrence of atmospheric pollution clear changes of length and necrosis of needles were observed only in areas within 700 m of the source of emission. Changes in needles were observed up to 2800 m from the fertilizer factory after 4 year. An important factor was the increased concentration of the contaminants emitted as a result of increased production. The juvenile stand responded later, and to a lesser extent, than the older stands. The only trees that have survived are those in areas over 1000 m from the source of emission. Seriously injured trees can be found also in areas 2 km from the source of emission. Isolation of a resistant strain would be of great economic importance. (Author abstract modified)

62144 **APTIC NO. 81841**

Kender, Walter J., E. F. Taschenberg, and N. J. Shaulis

BENOMYL PROTECTION OF GRAPEVINES FROM AIR POLLUTION INJURY. *HortScience, 8(5):396-398, Oct. 1973. 5 refs.*

Methyl 1-butylcarbamoyl-2-benzimidazole carbamate (benomyl) was successfully used as a dilute foliar spray to reduce atmospheric ozone injury (oxidant stipple) on Ives and Concord grapevines during three vineyard experiments in 1972. Although single and double applications were ineffective, three to seven multiple applications at 1.12, 3.36, and 6.72 kg/hectare were effective in increasing the resistance of vines to oxidant injury. The degree of protection afforded was directly related to the frequency of benomyl application. (Author abstract modified)

62145 **APTIC NO. 84541**

Kuribayashi, S.

SILKWORM DAMAGE DUE TO AIR POLLUTANT FLUORIDES. *(Fukkabutsu no taikiosen ni yoru kaiko no higai). Text in Japanese. Taiki Osen Nyusa (Air Pollution News), no. 74:1, 1973.*

In the vicinity of aluminum, phosphate fertilizer, roof tile, and glass factories, silkworms often suffer from intoxication and insufficient growth, resulting in imperfect cocoon formation and death. The cause is fluorides which have been exhausted in minute concentration of S from the factories, and have been deposited on the mulberry leaves which the silkworms ingested. When the fluoride content of mulberry leaves, usually about 15 ppm (dry matter), becomes more than 30 ppm, the silkworms show inactivity, delayed growth, and weight loss, and then die prostrated. Sometime the intoxicated silkworms show a blackening of internodal membranes not seen in intoxication due to other causes.

62146 **APTIC NO. 76451**

McCune, D. C.

SUMMARY AND SYNTHESIS OF PLANT TOXICOLOGY. *Advan. Chem. Ser., no. 122:48-62, 1973. 29 refs. (Presented at the American Chemical Society, Division of Agricultural and Food Chemistry Meeting, 161st, Los Angeles, Calif., March 31-April 1, 1971.)*

A general review of plant toxicology is presented. The effects of air pollution on plants are examined in terms of changes that occur within the plant under experimental conditions and the collating of this information with respect to biological organization, changes in the pollutant, and the effects of environmental factors. Topics discussed include: the genetic background of the plant, the effects of specific pollutants on plant enzymes, patterns of chlorosis and necrosis following pollutant exposure, plant adaptation to pollutants, and synergistic effects of various pollutant combinations. Specific pollutants considered include: sulfur dioxide, ozone, fluorides, peroxyacetyl nitrate, nitrogen oxides, chlorine, sulfur trioxide, and sulfuric acid.

62147 **APTIC NO. 51669**

Menser, H. A., A. H. Hodges, and C. G. McKee

EFFECT OF AIR POLLUTION ON MARYLAND (TYPE 32) TOBACCO. *J. Environ. Quality, 2(2):253-258, April-June 1973. 26 refs.*

Six Maryland tobacco cultivars were tested for resistance to air pollutants. Fumigation chamber tests disclosed that ozone used at 5 pphm for 6 hr destroyed about 10% of the leaves of Catterton, and injured 5 to 8% of the leaves of other cultivars. Ozone administered for 3 hr at 15 pphm damaged about 1/3 of the leaves and injured about 2/3 of the leaf surfaces when the concentration was increased to 30 pphm. When plants were exposed to 22 pphm for 3 hr, injury was 2 to 8% greater than was observed at 15 pphm. Wilson was more resistant to zoone than Maryland 10, Maryland 59, Maryland 64, Maryland 609, and Catterton. Maryland 10 and Maryland 59 tended to be as ozone-susceptible as Catterton. Maryland 64 and Maryland 609 resembled the ozone response of Wilson. None of the differences in susceptibility were statistically significant except between Catterton and Wilson. Ozone and sulfur dioxide mixtures acted synergistically to inflict ozone-type symptoms on all Maryland cultivars. No injury resulted when plants were fumigated singly for 4 hr with ozone at 3 to 3.5 pphm and sulfur dioxide at 45 to 50 pphm. The combination of these gases at the same concentrations and time interval produced 5 to 15% leaf injury. Twice as much injury occurred when mixed gases were used for 2 hr at 10 to 12 pphm ozone and 45 to 50 pphm sulfur dioxide. Sulfur dioxide injury thresholds were barely reached by a 3-hour exposure at 150 pphm. Estimated injury ranged from 2 to 6%. Stomatal characteristics of the six cultivars varied within a 3 sq cm area of a leaf at prime ozone susceptibility. Stomatal frequency may have been a more important factor controlling ozone injury than the diameter of apertures. Catterton and Maryland 10 showed almost 10 stomatal/field compared to 6 stomatal/field on leaves of Wilson. Field studies in the five-county Southern Maryland District disclosed a general correlation between resistance to ozone and resistance to weather fleck. Wilson, Maryland 64, and Maryland 609 were more fleck tolerant than Maryland 10, Maryland 59, and Catterton. Fleck was more severe in counties that were adjacent to Washington, D. C., and Baltimore, Maryland. Extensive fleck damage occurred, however, at a location 42 miles south/southeast of the District of Columbia. The severity of symptoms on Maryland cultivars and on such fleck-susceptible cultivars as Bel-W3, Burley 21, and Havana 142 suggested that during periods of air stagnation, oxidants probably exceed 10 pphm (Mast) throughout most of the Type

32 area, and are responsible for most of the fleck damage. (Author abstract)

62148 **APTIC NO. 76043**

Naryshkin, M. A., R. M. Aleksakhin, and N. N. Mishenkov

THE MIGRATION OF SR90, RU106, CS137 AND CE144 OF THE GLOBAL FALLOUT IN A FOREST BIOGEOCENOSIS. *(O migratsii Sr90, Ru106, Cs137 i Ce144, osedayushchikh s global nymi vypadeniyami, v lesnom biogeotsenoze). Lesovedeniya, no. 3:10-13, May-June 1973. 33 refs. Translated from Russian, 17p.*

The distribution of strontium 90, ruthenium 106, cesium 137, and cerium 144 of global origin in a birch-pine forest was studied in 1964-1970. The concentrations of Sr90 and Cs137 in the needles and leaves, branches, and bark were reduced by 3 to 10 times in 1970, compared with 1964. This is connected with a decrease in fallout intensity. The Sr90 and Cs137 content of the soil, forest litter, and above-ground portion of the phytocenosis in 1970 was 92-94.5, 2.8-3.6, and 2.8-4.3%, respectively. (Author abstract)

62149 **APTIC NO. 67066**

Nobel, Park S. and Cheng-Teh Wang

OZONE INCREASES THE PERMEABILITY OF ISOLATED PEA CHLOROPLASTS. *Arch. Biochem. Biophys., 157(2):388-394, 1973. 39 refs.*

The effect of short-term exposure of chloroplasts isolated from the leaves of Pisum sativum (peas) to high concentrations of ozone was examined. The inhibitory effect of O3 on endogenous photophosphorylation was apparently related to an increased permeability of the chloroplast limiting membranes induced by O3 exposure. A 5-minute treatment with 50 ppm O3 reduced the reflection coefficient of meso-erythritol from 0.84 to 0.58 and that of glycerol from 0.26 to 0.03. Such decreases in reflection coefficients indicate that O3 caused a marked increase in the permeability of the limiting membranes of the chloroplasts, which may result from an oxidation of membrane lipids. The decrease in the reflection coefficient of meso-erythritol was proportional both to O3 concentration (up to 30 ppm for 5 min of bubbling) and to time (up to 5 min at 30 ppm). Extrapolating these results to lower concentrations and longer times, O3 injury should be possible for a 2-hour exposure to plants to 0.3 ppm O3, as is indeed the case. (Author abstract)

62150 **APTIC NO. 67107**

Oelschlaeger, W.

THE PROBLEMS INVOLVED IN SAMPLING WITHIN AND OUTSIDE ZONES OF EMISSION. *(Die Problematik bei der Probeentnahme von Futtermittein in und ausserhalb von Emissionsgebieten). Text in German. Landwirt. Forsch. Sonderh., 26(1):89-99, 1973. 27 refs.*

Problems involved in the sampling of plant materials both inside and outside emission zones are considered, especially in regard to trace element analysis. The basic problem revolves around obtaining as accurately as possible an average sample of actual composition. Elimination of error possibilities requires a knowledge of such factors as botanical composition, vegetation stages, rains, mass losses in leaf and blossom parts, contamination through the soil, and gaseous or particulate emissions. Sampling and preparation of samples is also considered with respect to quantitative aspects of trace element analysis.

62151 **APTIC NO. 81947**

Pahlich, E.

ON THE MECHANISM OF INHIBITION OF MITOCHONDRIAL GLUTAMATE- OXALACETATE-TRANSAMINASE IN SO2-FUMIGATED PEAS. *(Uber den Hemm- Mechanismus mitochondrialer Glutamat-Oxalacetat-Transaminase in SO2-begasten Erbsen). Text in German. Planta, 110(3): 267-278, 1973. 17 refs.*

The effect of sulfur dioxide fumigation on the mitochondrial and cytoplasmic form of glutamate oxalacetate transaminase (GOT) in peas has been tested. The GOT is represented by two distinct proteins in peas and therefore its activity may be taken as a measure of action of certain effectors on different components of the cell. An optical method for the direct measurement of GOT activity in crude plant extracts has been established. The mitochondrial GOT in peas fumigated with SO2 is inhibited while at the same time at cytoplasmic form of the enzyme remains unaffected. The mechanism of inhibition of mitrochondrial GOT by sulfite/bicarbonate has been analyzed and could be shown to be of the mixed type.

62152 **APTIC NO. 72762**

Robbins, M. LeRon, Allan R. Beck, and Jack L. Weigle

DETOXICULTURE AND URBAN AIR POLLUTION. *J. Environ. Plann. Pollut. Control, 1(3):46-49, 1973. 19 refs.*

The development of plants capable of detoxifying air pollutants is proposed. A scheme is suggested which involves the screening of potential detoxifiers in exposure chambers followed by a breeding program to select the most efficient plants within a species. The establishment of greenbelts around urban areas as well as the utilization of crop plants for pollutant detoxification is also recommended. The use of plants as indicators of dangerous pollution levels is also discussed, with numerous indicator plants being listed for such pollutants as ozone, peroxyacetyl nitrate, sulfur dioxide, and fluorides.

62153 **APTIC NO. 76453**

Schuck, E. A.

CHEMICAL BASIS OF THE AIR POLLUTION PROBLEM. *Advan. Chem. Ser., no. 122:1-8, 1973. 10 refs. (Presented at the American Chemical Society, Division of Agricultural and Food Chemistry Meeting, 161st, Los Angeles, Calif., March 31-April 1, 1971.)*

The toxicity of various primary and secondary air pollutants is reviewed, with particular emphasis on damage to plants. Automobile exhaust products like ethylene speed up the aging processes in plants, while other air pollutants like nitric oxide decrease plant growth in a nondestructive manner. Other compounds in the air such as nitrogen dioxide, sulfur dioxide, ozone, and peroxyacyl nitrates also reduce plant growth and crop yield by mechanisms not yet completely delineated. In many instances where the atmospheric concentrations of such contaminants are in the tenths of a part-per-million range, the effects of exposure can cause complete loss of the crop. This is particularly true for Romaine lettuce, spinach, and certain tobacco species which are extremely sensitive to low concentrations of ozone and peroxyacyl nitrates. Crop yield reductions as high as 50% are observed with little outward manifestation of damage.

62154 **APTIC NO. 84477**

Solinski, Piotr

THE EFFECT OF FLUORINE EMISSION FROM A GLASS FACTORY ON THE SURVIVAL OF SILKWORM CATERPILLARS. *(O wplywic Emisji Fluoru Z Hut Szkla Na Przezywalnosc Gasienic Jedwabnika Morwowego). Text in Polish. Pol. Pismo Entomol., 43(2):415-422, April 30, 1973.*

The effect of fluorine emission from a glass-manufacturing plant on breeding silkworms in the vicinity and mulberry leaves on which they fed, was studied in order to demonstrate the toxicity of fluorine compounds. A total of 1000 silkworm caterpillars, strain K-110, were divided into 2 groups of which 1 was prophylactically dabbed with 1% chloramine solution in order to limit external infection while the 2nd one was not treated. On the 2nd and 3rd days after shedding, about 70% of the caterpillars showed symptoms of poisoning, such as sluggishness, skin darkening, cessation of feeding and, finally, death. The remaining caterpillars died at a later development

stage. Their bodies hardened within 2 days into a fossil-like consistency. The results obtained from both groups, revealed that the percentage of dead caterpillars in both groups was the same. A number of 41 cocoons collected, showed differences in size, weight and shape. The heaviest female cocoon weighed 2.22 g, the lightest male one 0.975 g. Of the 41 cocoons, 28 were healthy and 13 were sick with 9 dead non-pupated caterpillars and 4 dead pupae. Out of 4 pairs of copulating butterflies, 1 female laid partly fertilized eggs; the eggs of the rest were not fertilized. The chemical analysis of dead caterpillars and mulberry leaves which they ate showed a content of 0.0506% fluorine, with 0.613% in the ashes of the former and 0.1352% Fl2 in the ashes of the latter. It was also present in the feces of the caterpillars and their silk. The possibility of fluorine poisoning of other organisms, such as useful insects, breeding animals, and even man, was raised.

62155 **APTIC NO. 79943**

Taniyama, T.

AIR POLLUTION, ESPECIALLY SULFUR OXIDES WHICH DAMAGE AGRICULTURAL AND FORESTRY PLANTS. *(Taikiosen--tokuni iosankabutsu ni yoru norin shokubutsu higai). Text in Japanese. Denryoku Sangyo to Kogai (Power Ind. Pollut.), no.6:19-29, Sept. 1973. 14 refs.*

The major source of air pollution from the petroleum industry and the electric power industry is sulfur dioxide. The problem of damage to agricultural and forestry products due to sulfur dioxide is reviewed. Visible damage and its species specificity are described for Larix leptolepis, Populus nigra, Zelkova serrata, and Acer, as well as chick weed and dandelion. The present state of crop damage in the heavily polluted Yokkaichi area is described. The non-visible damage to rice plants is described, and the reduction of crop yield is explained in terms of visible and non-visible damage. The plant damage (reduced yield of rice crops) appeared before an increase in asthma patients, suggesting the usefulness of plant indicators for air pollution. Experimental results on the effects of sulfur dioxide on photosynthesis and plant respiration are described.

62156 **APTIC NO. 51340**

Wagner, K. H. and I. Siddiqi

ENVIRONMENTAL HEAVY METAL CONTAMINATION FROM INDUSTRIAL EMISSIONS. *(Schwermetallkontamination durch industrielle Immission). Text in German. Naturwissenschaften (Berlin), 60(3):161, March 1973.*

Lead, cadmium, and zinc concentrations in soil and green food samples taken from the Nordenham area of West Germany following massive lead discharge from a local lead smelter due to filter failure, as well as such concentrations in liver samples from cattle that died from lead poisoning during that event, were determined. The lead, cadmium, and zinc concentrations in the soil within 0.75 to 2.5 km distance of the lead smelter were in the respective ranges of 4550-524 ppm, 150-78 ppm, and 2030-228 ppm, and in green foods 19,400-555 ppm, 173-256 ppm, and 9100-612 ppm. The lead, cadmium, and zinc residue concentrations in cattle livers were in the respective ranges of 11-64 ppm, 0.4-1.7 ppm, and 8-217 ppm. Investigations of the hepatic enzyme activities revealed departures from the norm for GOT, GPT, LDH, and the phosphatases, and pathological values for GLDH, pyruvate, lactate, and MDH, which indicates interference of these heavy metals with cellular metabolism. Incorporation of lead within hepatic tissue cells was evidenced.

62157 **APTIC NO. 67067**

Yang, Shang Fa and Mahmoud A. Saleh

DESTRUCTION OF INDOLE-3-ACETIC ACID DURING THE AEROBIC OXIDATION OF SULFITE. *Phytochemistry, vol. 12:1463-1466, 1973. 16 refs.*

Indole-3-acetic acid (IAA) was rapidly destroyed in the presence of manganese ions (++), oxygen, and sulfite ion. The optimal pH for the reaction was between 5 and 6. The destruction was dependent on the aerobic oxidation of sulfite, but was not inhibited by superoxide dismutase. Tracer studies indicated that IAA was converted into at least three compounds. Decarboxylation of IAA was not involved in the destruction. This reaction is important in studying the effect of sulfur dioxide in IAA, a natural hormone, in vegetation. (Author abstract modified)

62158 **APTIC NO. 84569**

Yokobori, M., Y. Mashiko, H. Kondo, S. Ebine, and T. Ito

DAMAGE OF PINUS DENSIFLORA BY CHLORINE OR ITS COMPOUNDS. *(Enso Moshikuwa sono kagobutsu ni yoru akamatsu higai). Text in Japanese. Japanese Society of Ecology, Japanese Society of Ecology Annual Meeting, 20th, 1973, p. 28, 1973.*

A survey of plant damage was conducted on Pinus densiflora in Toga County, Ibaragi Prefecture in August 1971 and July 1972. Rhizosphaera kalkhoffii was found on the red-discolored parts of needles of P.d. in 1971 and 1972; needle development was delayed about 2 months, suggesting some exogenic effects. Although some effect of sulfur dioxide was indicated by the sulfur content of P.d. and P. thunbergii, the damage to other trees and herbs could not be explained by sulfur dioxide alone. The chlorine content of damaged leaves (new and old) of pine was conspicuously high and that of healthy pine leaves was lower. Experiments showed that the pine leaves changed to orange brown in color after 3 hr exposure to chlorine gas at 1.0 ppm, with higher chlorine content and with clear margins between damaged parts and healthy parts. In fields, pine trees covered with black smoke from a factory showed visible damage and higher chlorine contents. The low content of sodium of the damaged pine leaves denied the effects of a sea wind. These results indicate that the problem of plant damage was due to the black smoke from the factory which could contain chlorine or its compounds such as hydrogen chloride. Curiously enough, analysis of the smoke has never been carried out.

62159 **APTIC NO. 72880**

Yokohama Municipal Office (Japan), Working Group Surveying Effects of Air Pollution on Trees

RESULTS OF THE SURVEY OF TREE DAMAGE DUE TO AIR POLLUTION, PART 2: SURVEY OF UNTIMELY LEAF FALL OF ZELKOVA TREES. *(Jyumoku no Taiki-osen ni yoru eikyochosa. Dai 2-setsu Keyaki no fujirakuyo chosa). Text in Japanese. In: The Second Report of the Survey on Photochemical Smog. p. 201-205, March 1974.*

In order to determine the effects of air pollution on untimely leaf fall of zelkova trees, the rate of leaf fall, leaf necrosis, chlorosis, normal leaves, twig growth, the number of developed leaves, and the number of twigs on three designated branches of three trees each in 10 spots in Yokohama City were surveyed on July 14, 1973. The cumulative concentration of oxidant of the nearest monitoring spot from July 1 - 13 was taken as the representative value of oxidant. The rate of leaf fall ranged from 39.5 to 1.0%, the rate of necrosis ranged from 28.4% to 0, the rate of chlorosis ranged from 85.9 to 67.1%, and, in general, the rate of damaged leaves ranged from 100 (Hommoku, Kumisawa, and Kumisawa road areas) to 12.5%. No direct relationship between the rate of damage and cumulative oxidant concentration was found probably due to air pollutants other than oxidant and to the soil conditions; however, the high concentration of photochemical oxidants in midsummer strongly affects zelkova trees.

62160 **APTIC NO. 80081**

Ota Ward, Tokyo (Japan), Div. of Environmental Pollution Control

REPORT ON THE RESULTS OF SURVEY ON PLANTS AFFECTED BY AIR POLLUTION IN OTA WARD FROM JULY 1972 TO DEC. 1972. *(Ota-ku shokubutsu* *eikyo chosa hokokusho. Showa 47-nen 7 gatsu - Showa 47-nen 12 gatsu). Text in Japanese. 74p., March 1973.*

In order to carry out a tree-planting campaign in Ota Ward where air pollution has developed to a considerable degree, 8 public parks were chosen, each having an air monitoring station, and 5 species of young plants, Zelkova serrata, Populus nigra, Ginkyo biloba, Ligustrum japonicum, and Quercus myrsinaefolia were planted in them on June 26, 1972. The conditions of the different parks varied considerably; however, 84% of the plants rooted. A survey of plant growth was carried out in July, Sept., and Nov. 1972 and Jan. 1973. One group of trees showed no local damage difference (including P.n. and L.j.); another showed local differences (including Z.S., Q.m., and G.b.). No severe damage due to insects was observed. The relationship between the damage and air pollution has not been confirmed.

62161 **APTIC NO. 83853**

Div. of Environmental Sanitation, Shimane Prefectural Office

DAMAGE OF PADDY RICE PLANTS DUE TO THE EXHAUST GAS OF A STEEL PLATING FACTORY AND ITS COUNTERMEASURES. *(Yasui tekkojo no haishutsu gas niyoru suito higai to taisaku). Text in Japanese. In: Environmental Pollution in Shimane Prefecture, p. 221, 1973.*

Minute spots appearing on leaves of rice plants in fields neighboring a steel plating factory in Aug. 1972 and in June 1973 were studied. The causes were chromium and sulfuric acid contained in the exhaust gas of the factory. The damaged rice plant contained 6.62-10.55 ppm of chromium as compared to 0.87-0.89 ppm of chromium in healthy plants. The content of chromium and sulfuric acid in the exhaust were 0.15-0.30 ppm and 12.1-50.9 ppm, respectively.

62162 **APTIC NO. 83854**

Div. of Environmental Sanitation, Shimane Prefectural Office

DAMAGE DUE TO THE SMOKE OF A TILE MANUFACTURING FACTORY AND ITS COUNTERMEASURES. *(Miyazaki shoten kawara-kojo no baien ni yoru higai to taisaku). Text in Japanese. In: Environmental Pollution in Shimane Prefecture, p. 219-229, 1973.*

The withering of leaves of vegetables and rice plants in fields around a tile manufacturing factory was investigated. A survey was carried out revealing that the damage was due to fluorine in the smoke of the factory. The smoke contained 2.67 N cu m/hr of sulfur oxides, 0.06 g of dust/cu m, and 20.0 mg of fluorine/cu m. The harvested brown rice in the field nearby contained fluorine ranging from 1.0 to 9.0 ppm. Vegetables contained 68.0 ppm in leaves and 4.2 ppm in roots. The raw materials of the tile contained from 51.5 to 216 ppm fluorine.

62163 **APTIC NO. 84000**

Div. of Environmental Sanitation, Shimane Prefectural Office

DAMAGE DUE TO SOOT AND DUST FROM HITACHI METAL REFINERY AND ITS COUNTERMEASURES. *(Hitachi Kinzoku kara no baijin higai to sono taisaku). Text in Japanese. In: Environmental Pollution in Shimane Prefecture, p. 217-219, 1973.*

Complaints from sericulture farmers about damage to silkworms due to mulberry leaves polluted by soot and dust exhausted from the Yasugi factory of the Hitachi Metal Co. in March 1973 are discussed. Analysis of soot and dust from the improved facilities showed that in July 1973 sulfur oxides, dust, and fluorine in the exhaust gas decreased to values below the standard. However, the dust-fall in the mulberry field 120 m west of the factory was from 2.47 to 5.29 g/sq m/month. After the improvements, the fluorine content of the mulberry leaves in the field was 10-18 ppm, 12-18 ppm and 13-18 ppm in Aug., Sept. and late Aug., respectively, as compared to 60-71 ppm in July 1973. The percentage of healthy cocoons, and the weight of cocoons in May (spring season) were 52.5-72.0% and 1.9-2.0 g; in the autumn these figures were 90% and 2.0-2.3 g. The improvement of the facilities included dust collectors and bag filters.

62164 **APTIC NO. 84698**

Tokyo Metropolitan Research Inst. Environmental Protection (Japan)

INTERIM REPORT ON THE SURVEY CONCERNING THE EFFECTS OF PHOTOCHEMICAL SMOG USING MORNING GLORY AS A PLANT INDICATOR, BY THE COMMITTEE OF SPECIALISTS. *(Asagao niyoru Kokagaku gaku smog eikyo chosa chukan hokoku). Text in Japanese. 10p., Aug. 1973.*

Damage to plants by photochemical smog was studied in 1973. The leaf damage of morning glory (a highly susceptible variety of Scarlet O Hara and a slightly less susceptible variety of Violet) transplanted to 77 middle schools in Tokyo and 3 schools in places with clear air was studied during an occurrence of photochemical smog early in July. The results of inspection during July 16- 20, 1973 are given. The highest and lowest doses of oxidant (1 - hr, 0900-1600) during the period were 1535 and 866 pphm/hr. In 86% of the schools, the rate of leaf damage ranged from 50- 80% in Scarlet O Hara. In 77% of the schools, damage ranged between 40-77% in the Violet. The average rate of damaged leaves of the two varieties was 58% (6 out of 10 leaves were damaged). The area in which the average rate of damage was over 50% covered a very broad geographical region ranging from Edogawa to Chichibu Tama National Park. Necrosis appeared relatively more frequently in Scarlet O Hara. In control schools, except for a slight bleached spot, no damage was found in either variety. The distribution of oxidant concentrations did not necessarily coincide with the distribution of the rate of damaged morning glory leaves; however, there were many schools in which there was coincidence.

1972

62165 **APTIC NO. 73176**

Arndt, U.

THE KAUTSKY EFFECT AS A SENSITIVE PROOF FOR AIR POLLUTION EFFECTS ON PLANTS. *Chemosphere, no. 5:187-190, 1972. 15 refs.*

A sensitive method for detecting effects caused by air pollutants was developed based on reactions of phytotoxicants in chloroplasts. When plants are suddenly illuminated, they emit a variable red fluorescence followed by a constant one. This varying intensity is called the Kautsky effect. It is very sensitive to shifting of ions within the chloroplast and indicates disturbances in the photosystem. The measuring devices include a cuvette which produces the idealized curve. The curve changes its shape and height when certain air pollutants of organic or inorganic nature begin to influence the photosynthesis in the plants. Concentrations of 10 to the -6th power copper chloride can still be detected by the aid of changes in the fluorescence curve after an influencing period of 30 min. This offers the possibility to test native dusts, gaseous air pollutants, and sewage for their toxicity to algae.

62166 **APTIC NO. 84484**

Dolhova, L. H. and Z. T. Kosyukina

BIOLOGICAL PURIFICATION OF ATMOSPHERE IN COKE-CHEMICAL PRODUCTION. *(Do pitaniya pro biologichne ochishchennya atmosferi v umovakh koksokhimichnogo pidpriemstva). Text in Ukranian. Ukr. Bot. Zh., 29(2):172-176, 1972. 14 refs.*

Plants play an important role in biological purification of the atmosphere, accumulating sulfur compounds, chlorine, fluoride, and phenol. Soils also have the capacity to accumulate toxic substances of industrial origin. Phenols are among the most toxic environmental pollutants reaching the atmosphere with other compounds as a result of chemical and coke-chemical production. The ability of certain plants and soil under them to accumulate airborne phenols was studied. Experiments were conducted under conditions of continuous exposure to chemical substances (phenols, sulfur compounds) to determine the action on leaves of ailanthus (Ailanthus altissima Sw.), ash (Ulmus pinnato-ramrose Dieck), and poplar (Populus nigra L.). Determinations of phenol-destroying microorganisms were made in order to study soil phenol-detoxifying ability. Data obtained from experiments warrants the following conclusions: leaves of plants studied which grew for 14-16 yr in a phenol- polluted atmosphere contain visibly higher amounts of phenols compared to a control group from a botanical garden. The phenol content of soil under the plants studied was also higher than in the control group. Raised phenol content in leaves and soil is possibly connected with their ability to accumulate and collect industrial phenols found in polluted atmosphere.

62167 **APTIC NO. 67122**

Granger, Jean-Maurice

COMPUTER MAPPING AS AN AID IN AIR-POLLUTION STUDIES: MONTREAL REGION STUDY. *Sarracenia, vol. 15:43-83, Jan. 1972. 6 refs.*

A technique is described for evaluating the pattern and intensity of urban air pollution in the Montreal region using computer mapping of epiphyte sensitivity. The Montreal region is divided into two areas, rural and urban, with the boundary line being approximately 10 mi from the city center. Regression analysis is used to relate the index of atmospheric purity with the number of epiphytes per station. The land-use intensity index and the number of epiphytes per station are also correlated. Regression analysis indicates that the variation in index of atmospheric purity is almost completely explained by the variation in the number of epiphytes, with a 97% degree of information being retained. Twin selection of four species (recorded by presence and coverage only) offers a degree of information retention of 91.4% in the urban area and 95.7% in the rural area. The appropriate spread of the two selections, explaining at least 80% of the index of atmospheric purity, fits a grid with a spacing of 1 mi in thye urban area and 2 mi in the rural area. About six-sevenths of the urban values fall into the most polluted category, assuming an equal value range over eight categories. This occurs for an urban density threshold of about 28 persons/acre.

62168 **APTIC NO. 81771**

Havas, Paavo and Satu Huttunen

THE EFFECT OF AIR POLLUTION ON THE RADIAL GROWTH OF SCOTS PINE (PINUS SYLVESTRIS L.). *Biol Conserv., 4(5):361-368, Oct. 1972. 22 refs.*

The effect of air pollution on the radial growth of scotch pine trees situated within 1.5 km from a fertilizer plant emitting fluorine compounds and fertilizer dust was investigated. The radial growth of pines began to increase after the plant started functioning in 1952, and the increase was greatest and most regular in trees under 50 yr old. The radial growth of trees over 70 yr old was not affected significantly by fertilizer dust and other growth-promoting substances discharged by the plant. After the plant started using apatite and began emitting fluorine compounds, a decrease in radial growth was observed. The radial growth decline was greatest in trees 50-100 yr old and occurred before any visible symptoms of damage were manifested.

62169 **APTIC NO. 84151**

Kadota, Masaya and Takao Inoue

INVADING PATH OF SULFUR DIOXIDE INTO PINE LEAVES AS REVEALED BY MICRORADIOAUTOGRAPHY. *Nihon Ringaku Kaishi (J. Japan For. Soc.), 54(6):207-208, 1972.*

Radioautographic and microscopic studies of leaves from red pine (Pinus densiflora) exposed to radioactive sulfur dioxide (0.4 ppm) were performed. Sulfur dioxide entered the leaves through the stomata and accumulated in the inner surface of cells surrounding the stomata. These observations confirmed earlier conclusions about the entry of SO2 through leaf stomata based on indirect methods involving leaf exposures in the absence of light and experiments with stomatal surfaces covered with vaseline.

62170 **APTIC NO. 84547**

Kadota, Masaya and Kaoru Ota

OZONE SENSITIVITY OF JAPANESE PLANT SPECIES IN SUMMER, WITH SPECIAL REFERENCE TO A TENTATIVE SENSITIVITY GRADE LIST FOR APPLYING TO FIELD SURVEY ON OZONE INJURY. *(Hompo san shokubutsu no kaki ni okery ozone higai no kyojaku, tokuni ozone gai ni kansuru yagaichosa no hojo to shite no zantei teki higaido list). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 7(1):19-26, 1972. 7 refs.*

The degree of injury to plant leaves was studied when the plant was exposed to ozone at about 0.25 ppm for 5 hr (from 0900 to 1600) at 25-29 C, relative humidity of 75-88%, and illumination of 18-18 Klux. The results showed generally that agricultural crops and garden plants were relatively sensitive to ozone and there were many wild plants not sensitive to ozone. Microscopic findings on injured leaf sections are described. Specially resistant plants which did not show any visible injury to leaves were Solidago altissima, Erigeron annuus, E. sumatrensis, Cyperus microiria, and Dryopteris erythrosora; Pecteilis radiata, Physalis angulata. Polygonum flaccidum and Vigna catiang were very sensitive and showed injury after less than 3 hr exposure to ozone. Plants were classified as ferns, gymnosperms, evergreen trees, deciduous trees, herbs, and agricultural crops and as very resistant, resistant, intermediate, sensitive, and very sensitive. A list containing 70 plants so classified is given.

62171 **APTIC NO. 83884**

Komai, Y., K. Haneyama, O. Kamiyama, and M. Yamaguchi

ACCUMULATION OF HEAVY METALS AND THEIR BEHAVIOR IN SOIL AND PLANTS DUE TO AIR POLLUTION. PART 1. ACCUMULATION OF ZINC IN SOIL IN THE SOUTH PART OF OSAKA PREFECTURE. *(Taikiosen niyoru dojo shokubutsu ni okeru jukinzoku no shuseki to sono kyodo Dai-1-po. Osafu nambu ni okeru dojo no aen shuseki). Text in Japanese. Japan Soc. Soil Sci. Manure Meet., Osaka, 1972, p. 132. (April.)*

The accumulation of zinc, especially soluble zinc, in the surface soil in the southern part of Osaka Prefecture was thought to be due to air pollution. The determination of heavy metals in floating dust, falling dust, rain water, and surface running water revealed considerable amounts of zinc. The content of zinc in the surface soil in vegetable fields were the soil is periodically fertilized varied with the number of years of fertilization. It was concluded that the increase of heavy metals, especially zinc, was due to air pollution. The total content of zinc in soil in which water pollution was not a factor was 400 ppm in arable land and 1000 ppm in non-arable land. The amount of zinc soluble in 0.1 N hydrochloric acid was 70% at most.

62172 **APTIC NO. 83885**

Mayumi, Y. and F. Yamazoe

ABSORPTION OF FLUORINE FROM LEAF BLADE AND ROOT, AND DISTRIBUTION OF FLUORINE IN PLANT BODY, STUDIES UTILIZING RADIO-FLUORINE. *(18F riyo ni yoru fusso no yomen oyobi keikonteki kyushu to tainaibunpu ni tsuite). Text in Japanese. Japan Soc. Soil Sci. Manure Meet., Osaka, 1972, p. 133. (April.)*

Potted tomato and cucumber plants were exposed to hydrogen fluoride containing air for 1 hr. Other plants were root-soaked in an aqueous radioactive sodium fluoride solution for 1 hr.

Measurement by autoradiography and scintillation counter revealed that the fluorine absorbed from the leaf blades accumulated in the leaf periphery or the apex. The absorption was active in the photosynthetically active leaves of the plant: the distribution was 9.5% in leaves, 4% in stems, and 0.3% in roots. The fluorine absorbed from roots moved into the roots (43.5%), leaves (28.5%), and stems (28.0%) in the case of tomato, and into the leaves (39.2%), roots (37.3%), and stems (23.5%) in another case. The accumulation of fluorine was largest in the most active leaves.

62173 **APTIC NO. 84009**

Miyake, Y. and Y. Uno

ON THE PHYSIOLOGICAL SPOT DISEASE OF TOBACCO PLANT PART 2. ON THE CHANGE OF GLUTATHIONE CONTENT OF TOBACCO LEAVES DUE TO OZONE EXPOSURE. *(Tabako no seiriteki hantenshogai ni tsuite. Dai-2-ho. Ozone ni yoru hatabako tainaino giaththione no ganryo henka ni tsuite). Text in Japanese. Japan Soc. Soil Sci. Manure Meet., Osaka, 1972, p. 66. (April.)*

Results of exposing 5 kinds of yellow-variety of tobacco (Bel W3, MC1610, GH-4, Hicks-2, and Coker 139) to ozone at 40 pphm for 3 hr at 25 C and RH 70% are described. Seventy days after transplantation, the content of glutathione of the tobacco leaves and its change with time were recorded. The degree leaf damage decreased in the order of Bel W3 (especially susceptible), Coker 139, MC1610, GH-4, and Hicks-2. The content of soluble non-protein nitrogen of intact plants showed a tendency to be lower in ozone-susceptible varieties of BelW3, Coker 139, and MC1610. The same tendency was shown in the glutathione content of leaves. When exposed to ozone, the amount of reduced-type glutathione declined. A relationship between the respiration due to wound respiration and the change of content of glutathione with time was found.

62174 **APTIC NO. 47995**

Schindler, D. W., G. J. Brunskill, S. Emerson, W. S. Broecker, and T. -H. Peng

ATMOSPHERIC CARBON DIOXIDE: ITS ROLE IN MAINTAINING PHYTOPLANKTON STANDING CROPS. *Science, 177(4055):1192-1194, Sept. 1972. 15 refs.*

To determine the invasion rate of atmospheric carbon dioxide into the waters of a lake experimentally enriched with phytoplankton, the carbon:nitrogen:phosphorus ratios of seston were measured after weekly additions of nitrogen and phosphorus to the lake. In addition, the loss of radon-222 tracer from the epilimnion was measured. Both methods gave an invasion rate of 0.2 g/sq m/day of carbon. The invasion of atmospheric CO2 may be sufficient to permit eutrophication of any body of water receiving an adequate supply of P and N. (Author abstract modified)

62175 **APTIC NO. 83879**

Toyoda, M. and J. Umikita

GROWTH DISTURBANCE OF CROPS DUE TO DUST FALL OF CEMENT PART 1. STATE OF DAMAGE AND THE DAMAGE OCCURRENCE OF CROPS AROUND A CEMENT FACTORY. *(Cement funjin (Konai) ni kiin suru sakumotsu no seiiki shogai Dai-1-po. Cement kojo shuhen ni okeru higai hassei jokyo to higai keitai ni tsuite). Text in Japanese. Japan Soc. Soil Sci. Manure Meet., Osaka, 1972, p. 132. (April.)*

A yearly occurrence of crop damage was found in fields around several cement factories. The major components of cement dust collected in the factories were 44% calcium carbonate, 5% potassium, 0.8-2% magnesium, 15-17% silica, 2-3% iron, and 5-6% sulfur trioxide. The components of falling dust around the factory were 6.6-6.8% Ca, 3.3-9.0% silica, and 4.0-5.6% sulfur trioxide. The yield of brown rice in the field around the factory was 100-150 kg/10 acre less than that of unaffected fields; the difference was smaller as distance from the factory increased. The early growth of rice plants in the area was vigorous, but the later vitality of the plants became poorer, showing the effect of an excess of calcium. Cement dust containing harmful salts accumulated on the leaf-blade and sheath of plants, dissolving in water to damage the plants, especially the sheath, where plasmolysis leading to brown spots was found. The clogging of stomata by the dust leads to severe growth inhibition.

62176 **APTIC NO. 84012**

Uno, Y. and Y. Miyake

ON THE PHYSIOLOGICAL SPOT DISEASE OF TOBACCO PLANT PART 3. SPOT DISEASE AND FORMATION OF ETHYLENE. *(Tabako ni seiriteki shogai ni tsuite, dai-3-ho. hantenshogai to ethylene no seisei). Text in Japanese. Japan Soc. Soil Sci Manure Meet., Osaka, 1972, p. 67. (April.)*

Time-changes related to the ethylene generated in leaves of tobacco plants which were exposed to ozone at 25 and 50 pphm were traced. The formation of ethylene showed a peak after 2-4 hr of ozone exposure. Even after 24 hr of exposure, the amount of ethylene formation was higher in exposed plants than in non-exposed plants. There was a difference in ethylene formation between varieties different in ozone resistivity. The finding of greater ethylene formation in plant parts suffering from physiological spot disease led to this experiment.

62177 **APTIC NO. 46223**

Wallace, A. and E. M. Romney

ACCUMULATION OF LEAD IN ROADSIDE VEGETATION OF MAJOR HIGHWAYS IN SOUTHERN NEVADA. *In: Radioecology and ecophysiology of Desert Plants at the Nevada Test Site. California Univ., Los Angeles, Environmental Radiation Div. and California Univ., Riverside, Dept. of Soil Science and Agricultural Engineering, Rept. TID-25954, p. 379-381, 407-437, 1972. 9 refs.*

NTIS: TID-25954

Tetraethyl lead additives in vehicle fuel have been shown by several investigators to contaminate the soil and vegetation alongside roadway networks and urban areas. The portion of U. S. Highway 95 between Las Vegas and Mercury, Nevada is heavily traveled, as the result of daily commuter traffic, compared to the portion of equal distance extending further northwest. Lead contamination was apparent in foliage of desert vegetation collected alongside the roadway, reflecting the variations in traffic volume on the two portions of U. S. Highway 95 that were sampled. Lead contents greater than tenfold of normal were found in plant foliage alongside the heavily traveled roadway.

62178 **APTIC NO. 82435**

Chiba Prefectural Government (Japan)

MEASURES FOR PREVENTING PEAR DAMAGE: ICHIHARA AREA: ANALYSIS OF METEOROLOGICAL FACTORS AND INVESTIGATION. *(Ichihara-chiku nashi higai boshi taisaku jigyo, kisho kaiseki oyobi chosa). Text in Japanese. Chiba-ken Kogai Kenkyusho Nenpo (Ann. Rep. Chiba Pref. Res. Inst. Environ. Pollut.), no. 4:20-21, 1972.*

The damage to flowers and the leaves of pear trees in the flowering period in the Ichihara area on April 11 and 12 was studied. Sulfur oxides, fluorides, and meteorological conditions were investigated by examining the records for April 9-14. Although the weather on the 9th and 12th was bad due to the passing of a trough, the weather on the other days was good. Weather conditions were favorable to air pollution, due to weak winds. Days when the concentration of sulfur oxides was relatively high were the 10th (21 pphm), the 11th (19 pphm), the 13th (17 pphm) the 14th (14 pphm). The concentration of hydrogen fluoride was high on the 12th (0.5 ppb).

1971

62179 **APTIC NO. 43082**

Apelbaum, Akiva

ETHYLENE EFFECTS ON CELLULAR DIVISION, EXPANSION AND DIFFERENTIATION. *Miami Univ., Fla., Dept of Biology, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., Aug. 1971, 206p. 108 refs.*

Ethylene and supraoptimal 2,4-dichlorophenoxyacetic acid (2,4-D) inhibit the growth of the apical hook region of etiolated Pisum sativum seedlings by stopping almost all cell divisions in the tissue. The hormones also retard cell division in intact root tips and completely stop the process in lateral buds of isolated stem sections; in root tips and the stem plumule and subhook regions ethylene markedly inhibits DNA synthesis. It inhibits growth in the subhook region of intact etiolated pea seedlings by reducing the capacity of the polar auxin transport system which supplies auxin to the tissue. Applied and auxin-induced ethylene prolong the phase of cellular expansion in both etiolated and light grown seedlings, apparently by delaying wall rigidification. As long as ethylene is present, growth continues, proline incorporation is inhibited, glucose is incorporated into the cell wall, and the wall weight increases in proportion to tissue freash weight. The swelling caused by auxin and ethylene is due entirely to ethylene-induced cell expansion and does not involve stimulation of cell division in the subhook region. When ethylene causes the subhook tissue to swell it alters the newly deposited microfibrils orientation from a transverse orientation to a predominantly longitudinal direction. This accounts for the tendency of cells, exposed to ethylene, to expand radially rather than longitudinally. Ethylene and 2,4-D inhibit xylogenesis and completely prevent fiber lignification in the third internode of etiolated pea seedlings during 96-240 hours of treatment. When ethylene is removed after 72 hours, normal differentiation resumes. Ethylene may inhibit xylogenesis and lignification of fibers by interfering with DNA synthesis, altering the orientation of newly deposited microfibrils, and depressing incorporation of proline into cell wall protein so that the phase of growth is prolonged and that of maturity and differentiation is delayed. (Author summary modified)

62180 **APTIC NO. 81768**

Chang, Chong W.

EFFECT OF OZONE ON RIBOSOMES IN PINTO BEAN LEAVES. *Phytochemistry, vol. 10:2863-2868, 1971. 17 refs.*

The effect of ozone on cytoplasmic and chloroplast ribosomes in primary leaves of pinto bean plants was studied. Isolated ribosomes were analyzed by sucrose density gradient. An ozone level of 0.35 ppm for 20-35 min did not change the concentrations of various sedimenting particles of the cytoplasmic ribosomes. Similar levels of ozone did however decrease the population of chloroplast ribosomes per unit fresh weight of leaves. The distribution pattern of these chloroplast ribosomes was characterized by a low concentration of the fast-sedimenting polysome particles concomitant with a low magnitude of other slow-sedimenting components. The kinetics of ribosome populations during leaf growth indicated that ozone did not influence the daily levels of different ribosomal components of cytoplasmic ribosomes. However, ozone prematurely decreased the concentrations of polysomes and other components of chloroplast ribosomes below control levels at the early stage of leaf development. This latter effect may be the cause of ozone-induced premature senescence.

62181 **APTIC NO. 43046**

Edwards, Maurice Elton

THE EFFECTS OF ETHYLENE ON CELL DIVISION IN GAMETOPHYTES OF THE SENSITIVE FERN, ONOCLEA SENSIBILIS L. *Syracuse Univ., N. Y., Dept. of Botany, Thesis (Ph.D.), Ann Arbor, Mich, Univ. Microfilms, Inc., June 1971, 152p. 86 refs.*

When germinated gametophytes of the leptosporangiate fern Onoclea sensibilis were cultured in white light, all exogenously added concentrations of ethylene from 1-1000 microliter/l inhibited cell division by 50%. The resulting 50% inhibition of cell division, induced by ethylene, was caused by a reduction in the rate of cell division. The inhibitor ethylene was specific for cell division and was not a general inhibitor of gametophytic growth. Transition from 1-D to 2-D growth was delayed due to the reduced rate of cell division, but the conversion was not prevented. By culturing gametophytes in darkness and white light in enclosed chambers with an ethylene absorbent, mercuric perchlorate, inhibition of cell division was eliminated, thus confirming the role of ethylene as the active factor in the inhibition of cell division in growing gametophytes. Filamentous growth of gametophytes under all conditions tested was inversely correlated with the rate of cell division. Data from ethylene-added and ethylene-absorbed experiments supported the theory that 1-D or 2-D growth depended upon the rate of cell division. In dehydrated spores, ethylene blocked light-induced germination if it was applied during the first 4-8 hr of illumination. Hydrated spores were responsive sooner to light induction of germination than were dehydrated spores. For ethylene inhibited light-induced germination, the ethylene had to be applied within the first 2-4 hr of illumination. Recovery from ethylene inhibtion in darkness and light was possible, and the rate of recovery from ethylene inhibition was slower when retained in darkness than when exposed to white light. Dose-response curves for germination in light were different for ethylene-treated and non-treated spores, indicating that the germination process under ethylene treatment was different from germination in non-ethylene conditions. (Author summary modified)

62182 **APTIC NO. 76046**

Fischer, K. and U. Luettge

EFFECTS OF SULFUR DIOXIDE AS A COMPONENT OF AIR POLLUTANTS ON PHYSIOLOGICAL PROCESSES IN PLANTS. *(Ueber die Wirkungen von Schwefeldioxyd als Luftverschmutzengsbestandteil auf physiologische Vorgaenge in Pflanzen). Jahrbuch Tech. Hochschule, vol. 1971:31-41, 1971,. 17 refs. Translated from German, 16p.*

The effect of sulfur dioxide on the closing cells and the gas exchange function of leaf stomata was studied. An experiment with a radioactive tracer (sulfur 35) showed that SO2 enters the interior of the leaf through the stomata, accumulates in closing cells, and interferes with the mechanism that regulates the width of the stomata openings. Analysis of the gas exchange of leaves, using a closed glass vessel, revealed that SO2 severely restricts photosynthesis, as indicated by a decrease in the intake of carbon dioxide. The restriction of photosynthesis by sulfite compounds may occur by several means: the influencing of different enzyme systems, interference with the photosynthetic redox system, or by affecting the membrane system important to photosynthesis. Plants can be grouped according to which of several different enzyme systems is responsible for the first steps in photosynthetic CO2 fixation. It has long been thought that C4 plants are more susceptible to sulfite compounds than C3 plants. Experiments with glyoxal sodium bisulfate solution show that the restriction of the early stages of photosynthesis by sulfite compounds is similar for C3 and C4 groups. A constriction of the primary reactions of photosynthesis by sulfite compounds explains the relatively nonspecific lowering rate of CO fixing in the photosynthesis of C3 and C4 plants. Under special circumstances, the nonspecific restriction of photosynthesis is a specific effect of sulfide compounds on certain enzyme systems. (Author conclusions modified)

62183 **APTIC NO. 84557**

Kadota, M., Y. Yumiba, and A. Tanaka

PLANT DAMAGE DUE TO AIR POLLUTION. *(Taikiosen ni yoru shokubutsu higai). Text in Japanese. Anzen Kogaku (J. Japan. Soc. Safety Eng.), 10(4):189-196, 1971. 2 refs.*

A general description is given of plant damage, mainly discoloration and spots on leaves due to air pollutants such as sulfur dioxide, sulfuric acid mist, chlorine, hydrogen chloride, hydrogen fluoride, ozone, peroxyacetyl nitrate, and nitrogen dioxide. Every air pollutant and the acute and chronic symptoms it causes as well as the characteristic methods of causal identification are described. Species specific sensitivity of plants such as herbs and agricultural crops to each air pollutant are also given.

62184 **APTIC NO. 84599**

Komai, Y.

ACCUMULATION OF ZINC IN SOIL AND PLANTS DUE TO AIR POLLUTION- RESULTS OF SURVEY IN OSAKA PREFECTURE. *(Taikiosen no yoru dojo oyobi shokubutsu no aen shuseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), vol. 6:158, 1971.*

The zinc content of several crops, especially soybeans in Sakai, was much higher than that in crops harvested in other areas. The accumulation of zinc in soil was surveyed in the southern area of the city and its suburbs. The zinc content of leaves of 22 soybean plants collected from fields in the city averaged 300 ppm, with a high of 470 ppm. The largest accumulation was found in the eastern and southern parts of the city. Plants grown from the seeds obtained in a neighboring agricultural experiment station contained 5 times the zinc in leaves and 12 times the Zn in roots. The soil in which the soybeans were grown contained, on the average, 170 ppm of zinc. Of the five metals (zinc, copper, iron, manganese and lead), the largest variation appeared in the amount of zinc in soil. Among the metals found in floating dust, settled dust, rainwater and surface water, zinc was most abundant. It was presumed from these findings that the pollution of crops and soil by zinc was due to air pollution originating from the metals industry.

62185 **APTIC NO. 83145**

Kuribayashi, S.

ENVIRONMENTAL POLLUTION EFFECTS ON SERICULTURE AND ITS COUNTERMEASURES (2). *(Yosan ni okeru kogai to sono taisaku (2)). Text in Japanese. Sanshi Kagaku to Gijutsu (Sericultural Sci. Technol.), 10(3):48-49, March 1971.*

Symptoms on mulberry leaves due to air pollutants such as sulfur dioxide, hydrogen fluoride, chlorine, smokes, heavy metals in floating dust, pesticides applied by airplanes and exhaust gases and dusts (made by friction of tires on pavement) are described in detail. Sulfur dioxide causes oil-soaked type spots to appear on mature leaves (causing silkworms to lose appetite, become inactive, grow nonuniformly, delay coccooning, and suffer softening disease). Hydrogen fluoride causes browning and curling of the leaves only after 14 hr of 30 ppb, causing silkworm inactivity and death. The extent of damage to mulberry fields by air pollution in 1968 was 147 ha by sulfur dioxide, 33 ha by hydrogen fluoride, 172 ha by cement dust, 189 ha by automobile dust and 1388 ha by pesticides (118 ha by airplane).

62186 **APTIC NO. 83362**

Kuribayashi, S.

ENVIRONMENTAL POLLUTION OF SERICULTURE AND ITS COUNTERMEASURES (1). *(Yosan ni okeru kogai to sono taisaku, 1). Text in Japanese. Sanshi Kagaku To Gijutsu (Sericultural Sci. Technol.), 10(2):18-19, Feb. 1971.*

Pollution which affects sericulture includes smokes and dusts exhausted by industrial factories, pesticides applied by helicopter and airplane, and dusts due to motor vehicles. Pesticides in air damage 130 ton of cocoons/yr. The special feature of air pollution damage is that damage to mulberry tree leaves appears as damage to silkworm cocoons. The exhausted pollutants from factories go from air into soil, and are taken up by the mulberry tree. Healthy silkworms suffer injury in a very short time. The major symptoms are reluctance to eat, motionlessness, lying flat, agony, vomiting, rolling, and death.

62187 **APTIC NO. 83682**

Kuribayashi, S.

ENVIRONMENTAL POLLUTION AND SERICULTURE. *(Kogai to yowan). Text in Japanese. Japan Soc. Sericulture Lect. Meet., 27th, 1971, p. 1-2.*

The major environmental pollutants affecting sericulture are smoke and exhaust gases from factories, pesticides scattered from aeroplanes, and dust due to motor traffic. These affect silkworms directly, or indirectly via mulberry leaves fed the worms. The effects of air pollution on sericulture depend on the fact that minute amounts of pollutant not harmful to mulberry leaves may be toxic to silkworms. Damage to mulberry is accompanied by the loss of worms or reduced production of cocoons. The diagnosis of the damage starts with the identification of pollutant material in mulberry leaves and in the damaged worms. Several methods of preventing silkworm damage, such as the regulation of factories, pesticides, and motor traffic near mulberry fields are discussed.

62188 **APTIC NO. 84089**

Kuribayashi, S.

RELATIONSHIP BETWEEN THE CONCENTRATION OF GASEOUS HYDROGEN FLUORIDE AND OF GASEOUS SULFUR DIOXIDE AND ITS EFFECTS ON MULBERRY LEAVES AND SILKWORMS. *(Fukkasuiso gas oyobi aryusan gas no nodo to Kuwa oyobi kaiko ni oyobosu eikyo tono kankei). Text in Japanese. Japan. Soc. Sericulture Annu. Meet., 41st, 1971, p. 36. (April.)*

When mulberry trees were exposed to gaseous hydrogen fluoride at 0.2 ppm for about 2 hr or to 0.03 ppm for about 14 hr, visible signs of damage such as browning of the leaves from the apex or periphery or shrinking appeared, at a leaf fluorine content of 120-160 ppm. The silkworms, after continuously eating leaves containing 35-70 ppm of fluorine, showed chronic damage; after eating leaves containing more than 90 ppm of fluorine they showed acute damage. Mulberry trees exposed to gaseous sulfur dioxide at 2 ppm for about 72 hr showed visible damage, such as scattered oily immersion-type spots and contained as much as 8000 pppm sulfur. Silkworms that ate the leaves had chronic damage.

62189 **APTIC NO. 84545**

Kuribayashi, S., K. Yatomi, and M. Kadota

EFFECTS OF HYDROGEN FLUORIDE AND SULFUR DIOXIDE ON MULBERRY TREES AND SILKWORMS. *(Fukkasuiso oyobi nisanka io no kuwa oyobi kaiko ni oyobosu eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), vol. 6:155, 1971.*

Potted mulberry trees were exposed to hydrogen fluoride at 30 and 200 ppb for 4-72 hr, and to sulfur dioxide at 2 ppm for 8-72 hr to determine the leaf injury and amount of fluorine in the leaf. The effects of feeding the exposed leaves to silkworms were examined. Visible damage (browning and curling from the apex and periphery of leaves) began after 14 hr exposure to 0.13 ppm and 2 hr exposure to 0.2 ppm. About 120-160 ppm of fluorine accumulated (dry matter) in the damaged leaves. The silkworms continuously ate leaves containing 35-70 ppm of fluorine (dry matter), and showed chronic symptoms such as softening and black spots on the internodular membrane. Those fed with leaves containing more than 90 ppm showed acute intoxication with inactive behavior, then prostration leading to death. In the case of sulfur dioxide exposure, visible injury appeared after about 72 hr of exposure to 2 ppm of sulfur dioxide, in the form of oil-immersion-like spots, with 0.8% sulfur (dry matter). The silkworms which ate these injured leaves continuously showed loss of appetite, inactive behavior and poor growth, with chronic symptoms such as slenderness, growth retardation, or softening leading to death.

62190 **APTIC NO. 67056**

Linzon, Samuel N.

EFFECTS OF AIR POLLUTANTS ON VEGETATION. *In: Introduction to the Scientific Study of Atmospheric Pollution. B. M. McCormac (ed.), Dordrecht, Holland, D. Reidel Publishing, 1971, p. 131-151. 100 refs.*

The effects of various air pollutants on vegetation are outlined. Information on symptoms of injury, dosages required to cause injury, sensitivity and tolerance of various plant species, and predisposing environmental and other factors are discussed. Consideration is also given to methods of investigating and preventing the effects of air pollutants on vegetation. The specific pollutants discussed include: sulfur dioxide, oxidants, ozone, O3 and SO2 synergism, peroxyacetyl nitrate, nitrogen oxides, fluorides, chlorine, hydrogen chloride, ethylene, ammonia, mercury, and particulate matter.

62191 **APTIC NO. 38688**

Martinez, Joseph D., Madhusudan Nathany, and Venkatram Dharmarajan

SPANISH MOSS, A SENSOR FOR LEAD. *Nature (London), 233(5321): 564-565, Oct. 22, 1971. 6 refs.*

Using atomic absorption spectrometry, the lead content of samples of Spanish moss from various localities were measured and found extremely high. The samples which contained the most lead were collected from the busiest highways, the next highest lead content was in samples from Baton Rouge, and the third highest on a secondary road. Some of the samples were washed with an ammonium acetate solution to determine whether the lead was superficial or in the tissues. Consistent lead values in samples remote from roads and the ineffectiveness of washing one of these samples suggest that for these samples the lead may be in the tissues of the moss. The abundance of Spanish moss, an epiphyte and a member of the family Bromiliaceae, in the Gulf Coast provides the opportunity of establishing gradients from line and point sources of pollutants.

62192 **APTIC NO. 84561**

Matsuoka, Yoshihiro, Hisami Yamada, Tsuyoshi Takasaki, Osamu Udagawa, and Toshiro Ohno

EFFECTS OF SULFUR DIOXIDE ON PEAR POLLINATION. *(Nashi no juseisayo ni oyobosu aryusan gas no eikyo). Text in Japanese. Chiba-ken Nogyo Shikenjo Kenkyu Hokoku (Bull. Chiba-ken Agr. Exp. Stn.), no. 11:41-46, 1971. 22 refs.*

To determine the effects of sulfur dioxide on fertilization of pears, artificial pollination using pollens of Twentieth Century variety pears was carried out on Chojuro variety pears just before (A), during (B) and after (C) exposure to sulfur dioxide, in high (0.5 ppm) and low (0.2 ppm) concentrations of sulfur dioxide and in sulfuric acid mist (1/500 mole) for 8 hr in April at 22 C, at relative humidity of 70%. The flowers numbered 151, 155, and 122 in A, B and C plots at 0.5 ppm sulfur dioxide; 127, 145, and 180 in A, B and C plots at 0.2 ppm; and 124 and 242 in sulfuric acid mist. The number of fruits was 50, 15, 42, 69, 50, 108, 33 and 98, respectively, as compared to 194 in non-exposed plots. Of the fruits, the number of seeds/fruit was 7.0, 5.7, 8.0, 7.1, 7.4, 8.1, 7.5, and 7.9 respectively, as compared to 9.3 in non-exposed plots. The percentage of complete fruits (those with 8 or 9 seeds/fruit) was 38.0, 13.3, 52.4, 39.1, 42.0, 52.8, 39.8 and 41.8 respectively, as compared to 80.4 in non-exposed plots. It was concluded that the effects of sulfur dioxide appear not only on the number of fallen fruits but also on the fertilization activity, and that a very slight exposure to sulfur dioxide which does not affect the bearing of fruits can affect the fertilization and the seed formation.

62193 **APTIC NO. 84008**

Mayumi, Y. and F. Yamazoe

ON THE DISTRIBUTION AND STATES OF SULFUR IN THE PLANT BODY DAMAGED BY SULFUR DIOXIDE. *(Aryusan gas ni yoru higai shokubutsu chu no io no bunpu oyobi keitai ni tsuite). Text in Japanese. Japan Soc. Soil Sci. Manure Meet., Osaka, 1971, p. 170. (Oct.)*

Potted plants were exposed to radioactive sulfur dioxide at about a few ppm for 5 hr. and the exposed plants were radioautographed to see the distribution of absorbed sulfur. The absorption of sulfur was highest in the leaves of most active photosynthesis, main accumulation occurring between veins. In decreasing order, accumulation was in: leaf, petiole, stem, and root. In flowers, the accumulation was more rich in sepals than in petals. It seems likely that species-specific absorption is not proportional to the resistivity of the plant to damage. It was found that about 80% of the sulfur dioxide absorbed from the leaves remained in water-soluble form. In another experiment in which plants were exposed to sulfur dioxide for a relatively longer period, it was found that about 10% of the absorbed sulfur dioxide was assimilated into protein, the remainder continuing in the water-soluble form.

62194 **APTIC NO. 83182**

Mochida, M. and M. Yoshida

SYMPTOMS OF FLUORINE INTOXICATION ON SILKWORMS, ESPECIALLY THE ABNORMAL ARTHROIDAL MEMBRANE. *(Kaiko no fussochudokushojo, tokuni setsukanmaku no ijo to sono seppen kansatsu). Text in Japanese. Japan Soc. Sericulture Annu. Meet., 41st, 1971, p. 24. (April.)*

Fluorine on or in mulberry leaves severely damages silkworms. The symptoms of intoxication of silkworms due to fluorine are usually chronic, consisting of irregular growth, loss of appetite and motion, hardness when touched, tension of the arthroidal membrane, spots and streaks on the arthroidal membranes and on the apex of the abdominal appendages, and fragile epidermis. Histologically, although the shape of the corial cells does not change, the cuticular layers degenerate (solidify) from the outer layer, and lose their dyeability, with a strong silver reaction. The degeneration develops into internal tissues in some cases. These changes seem to be due to abnormality in the cuticle secretion function. After bringing silkworms into contact with monofluoroacetoamide for one day, the belt-like spot in the arthroidal membrane appeared more vividly and typically than other symptoms.

62195 **APTIC NO. 84486**

Pisut, Ivan

GEOGRAPHIC DISTRIBUTION OF THE LICHEN SPECIES LOBARIA (SCHREB.) HUE IN SLOVAKIA. *(Verbreitung der Arten der Flechtengattung Lobaria (Schreb.) hue in der Slowakei). Text in German. Zb. Slov. Nar. Muz. Prir. Vedy, 17(1):105-130, 1971. 60 refs.*

The geographic distribution of Lobaria amplissima (Scop.) Forss., L. scrobiculata (Scop.) DC. em. DR., and L. pulmonaria (L.) Hoffm. in Slovakia was studied on the basis of literature references covering the last two centuries of herbological collections. A detailed diachronic study of the geographic distribution of L. pulmonaria showed a definite decline of this species in Slovakia during the last decades. This species became rare or disappeared completely at lower altitudes, and the lowest altitude limit of its existence has shown a steady elevation. The rarefaction and disappearance of L. pulmonaria and other lichen species in Slovakia is attributed mainly to the increased air pollution as a result of industrialization, automobile and railroad traffic, and tourism.

62196 **APTIC NO. 67141**

Schwabe, Calvin W., John Sawyer, and Wayne Martin

A PILOT SYSTEM FOR ENVIRONMENTAL MONITORING THROUGH DOMESTIC ANIMALS. *Preprint,* *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Inst. of Electrical and Electronic Engineers, New York; Instrument Society of America, Pittsburgh, Pa.; National Aeronautics and Space Administration, Washington, D. C.; and National Oceanographic and Atmospheric Administration, Washington, D. C., 3p., 1971. 3 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1044.)*

A pilot system for environmental monitoring is in its early phases of development in Northern California. It is based upon the existing nationwide Federal-State Market Cattle Testing (MCT) Program for brucellosis in cattle. This program depends upon the collection of blood samples at the time of slaughter from identified cattle. Since the cattle population of California is broadly distributed throughout the state, the pilot system intends to utilize these blood samples to biologically monitor the distribution and intensity of selected environmental pollutants. In a 2-year preliminary trial, the feasibility of retrieving, utilizing for a purpose similar to this, and tracing back to their geographic areas of origin of MCT samples has been demonstrated. (Author abstract modified)

62197 **APTIC NO. 84088**

Shigematsu, H., H. Sugiyama, S. Homma, S. Hatta, K. Ogawa, M. Maura, M. Toyama, and M. Shiomi

STUDIES ON ENVIRONMENTAL POLLUTION IN ANNAKA, PART III, CADMIUM AND ZINC. *(Annaka kogai ni kansu ru kenkyu III, cadmium zinc). Text in Japanese. Japan. Soc. Sericulture Annu. Meet., 41st, 1971, p. 58. (April.)*

In mulberry leaves around the Annaka Refinery of the Toho Zinc Co., much cadmium, zinc, and lead were found due to dust from the refinery. However, these amounts of each metal do not entirely account for extreme toxic responses of silkworms. When the leaves were fed to silkworms, much damage occurred. These three metals were fed to the worms. Cadmium and zinc each affected growth; only cadmium affected mortality; but there was a synergistic action between cadmium and zinc on both growth and mortality. There was also synergism between cadmium and lead in the presence of large amounts of zinc.

62198 **APTIC NO. 44052**

Tarabin, V. P., R. M. Shatskaya, and L. V. Chernyshova

CONTENTS OF NITROGEN CONDITIONS OF AIR CONTAMINATION WITH PLANTS UNDER CONDITIONS OF AIR CONTAMINATION WITH INDUSTRIAL WASTES. *(Vmist azotu ta fosforu v lysti derevnykh roslyn v umovakh zabrudnennya atmsofernoko povitrya vykydamy promyslovykh pidryyemstu). Text in Russian. Ukr. Bot. Zh., 28(6):781-783, 1971. 1 ref.*

A study of nitrogen and phosphorus contents in the leaves of woody plants was conducted against a background of different air and soil contamination with wastes of metallurgic and coke-chemical plants. It was found that the content of total protein nitrogen and phosphorus decreases with aging of the leaves in all the plants under study. Air contamination causes, at the beginning of the vegetation period, an increase and then, under conditions of great contamination, a drop in the content of total nitrogen in comparison with controls. The drought resistant plants Quercus robur L. and Robinia pseudoacacia L., under conditions of air contamination with industrial wastes, preserve the exchange of nitrogen protein and phosphorus at a higher level in comparison with the less resistant Aesculus hippocastanum L. and Tilia parviflora Ehrh. (Author summary modified)

1970

62199 **APTIC NO. 43000**

Wojcicka, I.

EFFECT OF AIR POLLUTION ON VEGETATION. *Air. Conserv. (English Translation from Polish of: Ochrona Powietza), 4(1):1-5, 1970. 5 refs.*

NTIS: TT 70-55124/1

The adverse effects of air pollutants on vegetation and the resulting economic and public losses are discussed. Means of preventing devastation of vegetation and the envisaged lines of future studes are also considered. Air pollutants generally have a negative effect on vegetation. Knowledge of the specific effects of pollutants on plants is very incomplete. Sulfur dioxide slows photosynthesis, transpiration, and disrupts the water balance of the cell. Sulfur seems to bind the iron in chloroplasts; groups of cells collapse; and bleached spots appear on leaves. The effect of carbon monoxide does not become deleterious until very high levels are reached at which point the plant is poisoned by its own metabolic products. Particulates clog the stomata of the leaves and also block the sunlight needed by the chloroplasts. In the past 75 yr, some forest crops have deteriorated by two or three classes. Studies made in Germany near urban areas showed that all vegetation was being poisoned. Conifers and fruit trees are especially susceptable. The reconstruction of forest stands with immune species is necessary and the problem of controlling gaseous pollutants should be mastered.

62200 **APTIC NO. 36968**

Wullstein, L. H. and Kristen Snyder

ARSENIC IN THE ECOSYSTEM. *Preprint, 4p., 1970. 24 refs. (Presented at the International Air Pollution Conference, 1970.)*

The effects of arsenic on rates of mineralization in soil were investigated using samples subjected to pollution from a copper smelter. The samples contained up to 245 ppm arsenic compared with control samples containing 10 ppm arsenic. Mineralization was studied by adding a constant amount of peptone to the samples and comparing the rates of ammonification, nitrosofication, and nitrification. Then concentrations of 50, 150, and 250 ppm arsenic were added to the control samples and similar mineralization rates were determined. Ammonification rates of the polluted and and control samples amended with both peptone of arsenic were similar; however, rates at which ammonium was oxidized differed. Nitrosofication and nitrification rates of the polluted samples were reduced compared to those of the control samples. Field methods of soil sampling, laboratory procedures, including determination of moisture, pH, total and gaseous arsenic, total nitrogen, and soil respiration, and complete test results are discussed. (Author abstract modified)

1960

62201 **APTIC NO. 49914**

Rohmeder, E.

THE EFFECT OF DUST AND SOOT ON THE GROWTH OF SPRUCE TREES. *(Die Wirkung von Staub und Russ auf den Zuwachs der Fichte). Forstwirt, Holzwirt., 15(13):245-248, 1960. 21 refs. Translated from German. Translation Consultants, Inc., Arlington, Va., 17p.*

The effect of lime-rich road dust, calcium carbonate dust, and soot from wood and coal-fired furnaces on the growth of spruce trees was studied. Forty spruces of common heredity were treated with the dust for an entire growing season. In the following year, the growth performance and the production of shoots and needle mass in the plants treated with dust were substantially below those of the control plants. The root mass produced was also smaller in the treated plants. The considerable growth retardation after dust treatment was primarily explained by the withdrawal of light and the resultant reduction in assimilation performance. In exposure to soot, however, the corrosive effect of the chemicals in the soot increase the extent of plant damage.

1951

62202 **APTIC NO. 35210**

Allcroft, Ruth

LEAD POISONING IN CATTLE AND SHEEP. *Vet. Rec., 63(37):583-590, Sept. 15, 1951. 11 refs. (Presented to the N.V.M.A., South-Eastern Division, Tunbridge Wells, England, May 24, 1951.)*

Data are presented on increased concentrations of lead in tissues, blood, and feces of cattle following ingestion of various lead compounds and on the possibility of chronic lead poisoning in livestock. Lead compounds clearly cause a rapid rise in the amount of lead in the blood followed by a very slow return to normal levels. The highest tissue concentrations are found in the kidney cortex and liver. Values higher than about 40 ppm in the cortex and 10 ppm in the liver are of definited diagnostic significance where there is collateral evidence of lead poisoning. The fact that blood lead values remain abnormally high even when fecal lead values have returned to normal also has diagnostic value. If both blood and fecal values are elevated, it can be assumed that ingestion of lead occurred within recent weeks. Chronic lead poisoning is unlikely to occur in animals grazing pastures contaminated by plumbiferous dust. The only danger to farm stock, especially bovines is acute poisoning by paint and rations heavily contaminated with lead compounds.

1949

62203 **APTIC NO. 42491**

Vas, K. and M. Ingram

PRESERVATION OF FRUIT JUICES WITH LESS SO2. *Food Mfr., vol. 24:414-416, Sept. 1949. 10 refs.*

The theoretical relation between the pH of a solution and the proportions of undissociated sulfurous acid, HSO3, and sulfur trioxide ions in it, is shown. From pH 3.5 downwards, even slight alterations of pH cause substantial changes in the proportion of the total sulfur dioxide, which is in the non-ionized form. There is thus good reason to suppose that slight additions of acids will correspondingly reduce the amount of SO2 necessary to prevent spoilage in fruit products. To test this supposition, experiments were carried out with orange juices acidified to different pH values with concentrated aqueous hydrogen chloride. The preserving power of a given quantity of SO2 can be related to the amount present in the undissociated form.

1927

62204 **APTIC NO. 40599**

Cristiani, H.

FLUORINE EMISSIONS OF INDUSTRIAL ORIGIN. EFFECT OF FLUORINE ON PLANTS AND ANIMALS. *(Emanations fluorees d origine industrielle. Action du fluor sur les plantes et les animaux). Text in French. Chim. Ind. (Paris), vol. 17:158-168, May 1927. (Presented at the Congress de Chimie Industriel, 6th, 1926.)*

Shrinkage and drooping of cress plants and grass, and lesions in dandelion leaves, caused by a 1-hr exposure to fluorine vapors in a test chamber are described. In the vicinity of an aluminum plant, where the electrolytic bath is composed of cryolite, a sodium- aluminum fluoride, vegetables and the leaves of fruit trees show signs of burning and great damage can be observed on forest trees. Animals are affected by fluorine through their fodder. Guinea-pigs fed plant food exposed to hydrofluoric acid gases develop fluorosis, but with very small concentrations, death may occur only after a year or more. Cows afflicted with this disease due to fodder harvested in fluorine-infested areas show initial symptoms of lameness of one or more legs, stamping by the animal, resting on one leg and then the other, inability to rise, and spontaneous sprains and bone fractures occurring in the stable. After several months, the animal gradually grows thin with a dry, hard hide and eventually dies. Experiments with corpses of animals who died of fluorosis have shown that their bones are more brittle than those of normal healthy animals.

1923

62205 **APTIC NO. 40794**

Swain, Robert E.

ATMOSPHERIC POLLUTION BY INDUSTRIAL WASTES. *Ind. Eng. Chem., 15(3) 296-301, March 1923. 1 ref.*

Carbon dioxide, coal, and sulfur dioxide are discussed as sources of pollution, which may affect plant growth and health. Carbon dioxide, an enormous waste product, is absorbed by plant leaves and converted through photosynthesis to substances which are food for animals. In industrial areas where coal is burned, it is the chief source of pollution. Sulfur dioxide is found in the waste products of metallurgical operations. A rapid method of estimation of sulfur dioxide in air by means of an iodine-starch solution is reviewed. The value of this method consists in employing moving atmospheres containing known amounts of sulfur dioxide in artificial fumigation. The active part of a gas necessary to produce a certain effect on a plant cell is expressed by a fundamental equation; the concentration of gas necessary to cause injury is also calculated. Legal solutions; a knowledge of prevailing sulfur dioxide concentrations near the surface of the ground; reduction either by conversion to sulfuric acid, or by an increase of dilution with air before the level of vegetation is attained; better control of plant operation; more attention to stack losses; and new markets for by-products are considered as answers to the problem of SO2 contamination.

1915

62206 **APTIC NO. 40587**

Blankinship, J. W.

CONDITIONS OF PLANT LIFE IN THE SELBY SMOKE ZONE, JANUARY 1 TO JULY 1, 1914. *Bull. Bureau Mines, no. 98:381-397, 503-520, 1915. 86 refs.*

An examination of trees and plants in the Selby smoke zone revealed that injuries attributed to smoke from the Selby smelter were in fact due to common fungus diseases, insect pests, flooding, drought, frost, fire, and improper care. The smoke zone was entirley free from any actual smoke injury to vegetation during the period of observation. In addition, smelter smoke had not the slightest effect on fruits or yields of cereals in the district.

62207 **APTIC NO. 40588**

Jones, Wyatt W.

THE OCCURRENCE OF SULPHUR DIOXIDE INJURY TO PLANTS IN THE SELBY SMOKE ZONE. *Bull. Bureau Mines, no. 98:398-427, 503-520, 1915. 86 refs.*

Field conditions in the Selby smoke zone in California were investigated with respect to the occurrence of plant injury due to sulufur dioxide. The common fungus diseases, the presence of insec pests, the nature of the soil, and the cultural methods and practices were also observed. The regional vegetation as well as the cultivated crops, trees, and plants in the zone were studied. Symptoms of smelter-smoke discoloration on native species, bleaching of oat blades, barley, and native grasses, and chlorosis were few and insufficient to cause material reduction in the yield of crops; most of the injuries wer attributed to fungus growths, pests, improper fumigation procedures, poor irrigation, climatic conditions, and soil leaching. The greater part of the area in which smoke markings were observed was not under cultivation but was devoted to pasture.

EFFECTS-MATERIALS

1976

62208 **APTIC NO. 81098**

Haynie, F. H., J. W. Spence, and J. P. Upham

EFFECTS OF GASEOUS POLLUTANTS ON MATERIALS - A CHAMBER STUDY. *Environmental Protection Agency, Research Triangle Park, N. C., Environmental Sciences Research Lab., Program Element 1AA008, Rept. EPA-600/3-76-015, 97p., Feb. 1976. 18 refs.*

The effects of sulfur dioxide, nitrogen dioxide, and ozone on a variety of materials were assessed using controlled environment exposure chambers. The study materials included: weathering steel, galvanized steel, aluminum alloy, paints, drapery fabrics, white sidewall tire rubber, vinyl house siding, and marble. The exposure experiment was statistically designed using a two- level factorial arrangement to identify the environmental factors or combination of factors, or both, that caused materials damage. Only 22 out of a possible 200 different adverse effects were statistically significant at better than a 95% confidence level. Sulfur dioxide, relative humidity, and the interaction between them were the main factors responsible for adverse effects. A number of empirical functions were developed that related materials effects to various factors causing the effects, and an exceptionally good relationship was obtained for the corrosion of weathering steel. (Author abstract modified)

62209 **APTIC NO. 83708**

Lewis, Norris E., Charles W. Reed, James J. Decorpo, and Jeffery R. Wyatt

A COMPARATIVE STUDY OF THE PERFORMANCE OF ELECTRICAL SLIDING CONTACT LUBRICANTS IN A CHEMICALLY ACTIVE ATMOSPHERE. *IEEE (Inst. Elec. Electron. Engrs.) Trans. Parts, Hybrids, Packag., 12(1):45-50, March 1976. 4 refs.*

The performance of sliding contract lubricants, including a diester-chlorofluorocarbon blend, a neopentyl-polyolester-diester blend, a four ring polyphenyl ether, a perfluoroalklypolyether, and a perfluorotributyl amine, in an atmosphere composed of several chemical compounds was determined. The compounds were those that outgassed at 65 C from electro-mechanical assemblies normally used in guidance systems. The performance of the lubricants was measured as a function of electrical noise and friction of the sliding contacts. As gas chromatography/mass spectroscopy study showed that many of the compounds outgassed from the assemblies are transferred to the lubricated sliding contacts. The time required for the outgassed compounds to approach a maximum concentration was 600 to 800 hr. Therefore, when selecting a llubricant for use in a similar environment, care should be taken to evaluate it over a sufficient period of time to allow for the maximum contaminant concentration to be reached. Two types of assemblies, manufactured using different materials and processes, were tested. Specular reflectance infrared measurements indicated both the lubricated and the nonlubricated gold coupon surfaces had additional structure after exposure to the assemblies. The outgassed compounds included chlorofluorocarbons, chlorinated hydrocarbons, amines, aldehydes, alkanes, alkenes, alcohols, ketones, siloxanes, silanes, halogen substituted silane, ethers, aromatic hydrocarbons, perfluorocarbons, phenols, nitriles, and heterocyclics. Discretion should be used when selecting fabrication materials. Vacuum baking can be applied to reduce the number of outgassed compounds to a minimum. The final selection of a lubricant should be influenced by the chemical environment to which it will be exposed. (Author abstract modified)

1975

62210 **APTIC NO. 79696**

Biestek, Tadeusz

CORROSION RATES OF ZINC COATS IN NATURAL ATMOSPHERES. *(Szybkosc korodowania powlok cynkowych w naturalnych atmosferach). Text in Polish. Ochr. Koroz., 18(5):129-134, May 1975. 21 refs.*

The corrosion rates of galvanized zinc coats in different typical natural atmospheres in Poland (industrial, urban, seaside and rural), were determined, and compared with those of zinc coats and zinc in other countries under the same natural atmospheric conditions. Low-carbon steel plates with a zinc coat of 1,2,4,7,15 and 30 micron thickness were tested with 5 samples each per coating. Differences in the level of aggressiveness of the separate corrosive environments were established, attributable to varying air pollution intensity. Sulfur dioxide (SO2) pollution of the air showed the greatest effect in this respect. A somewhat higher corrosion resistance was displayed by the coats placed in galvanizing cyanide baths than by those dipped into a sulfate bath, probably due to a difference in the crystalline structure of the types of coating. Corrosion rates of zinc coats varied during the year, which was explained by the fact that the air reached a higher SO2 content during the winter than during the summer, and by a higher solubility of the corrosion products as the effect of higher moisture content and more frequent precipitation in the winter. Spring and early summer showed formation of layers on top of the zinc coat demonstrating greater protective properties. A comparison of corrosion rates determined for typical natural atmospheres in Poland with those abroad under the same conditions revealed that both were within the same range of magnitude.

62211 **APTIC NO. 76526**

Knight, Arthur R. and Arun Verma

EFFECT OF NATURAL GAS ODORANTS ON POLYVINYL CHLORIDE PIPE. *Ind. Eng. Chem. Prod. Res. Develop., 14(4):304-308, Dec. 1975. 3 refs.*

The effect of natural gas odorants on polyvinyl chloride pipe (PVC) and polyethylene (PE) pipe was studied. Although odorants are used in the natural gas pipelines in vapor form, liquid odorant was used directly in the study. Both the commercial odorants and their individual components were studied. Tertbutyl mercaptan does not affect either PVC or PE pipes. Polyethylene pipes does not absorb or lose their mechanical properties when in contact with isopropyl mercaptan, n propyl mercaptan, methyl sulfide, or tertbutyl mercaptan. The mechanical strength of PVC pipe is affected in increasing order by isopropyl mercaptan, methyl sulfide, and n propyl mercaptan. Increase in weight of the pipe due to absorption of odorants, the selective absorption by the pipe, as well as deterioration in mechanical strength of the pipe in contact with liquid odorant occurred. Melting points and vapor pressure properties of an odorant blended in the laboratory, and having minimal effect on PVC pipe, were also studied. It is necessary to add other components to tertbutyl mercaptan to reduce the freezing point. The only acceptable addend studied is isopropyl mercaptan. (Author abstract modified)

62212 **APTIC NO. 84027**

Kongshaug, Helge

UNESCO PROJECT TO SAVE VENICE. *(UNESCO-prosjekt skal redde lagunebyen Venezia). Text in Norwegian. Tekn. Ukeblad (Oslo), 122(50):134, 137, 141-142, Dec. 1975.*

General and environmental problems of Vencie are discussed in connection with the UNESCO project to save this city. The deterioration of buildings due to industrial air pollutant emissions from the industrial area in the Mestre region, the second largest in Italy, represents the major environmental problem for Venice in general. The polluting industries are unable to bear the costs of the necessary air pollution control measures alone.

62213 **APTIC NO. 79746**

Russell, Clifford S.

ENVIRONMENT AND DEVELOPMENT. *Biol. Conserv., 7(3):227-234, April 1975. 6 refs.*

Problems and solutions associated with economic development and environmental pollution are discussed. Developing countries are not unpolluted. There are problems in waste disposal, auto congestion and emissions; combustion residuals such as sulfur dioxide; high noise levels; and growing volumes of solid waste. These damages may already be great enough in some urban areas to justify devoting scarce resources to their control in the interests of a healthy work force. For truly global problems, such as persistent pesticides and long term carbon dioxide build-up, the industrialized world should accept responsibility for pollution control. Similarly, the industrialized world should be paying for species and landscape preservation.

62214 **APTIC NO. 76373**

Spence, J. W., F. Haynie, and J. P. Upham

EFFECTS OF GASEOUS POLLUTANTS ON PAINTS: A CHAMBER STUDY. *J. Paint Technol., 47(609):57-63, Oct. 1975. 5 refs.*

The significant direct and synergistic effects of air pollutants on exterior paints were identified. Exposure chambers were used that simultaneously control temperature, relative humidity, and concentrations of sulfur dioxide, nitrogen dioxide, and ozone. Sulfur dioxide concentration is a significant factor for controlling the erosion rate of oil base house paints. A multiple linear regression of SO2 concentration and relative humidity accounts for 61% of the variability. Of the environmental factors that increase the erosion rate of vinyl coil coating, SO2 times relative humidity accounts for 34% of the variability in a simple linear regression. This is the only factor that is significant at the 95% probability level. At the primary standard of 80 microgram/cu m SO2, the linear regression equation indicates that SO2 contributes less than 5% to the erosion rate. Ozone is the only pollutant that has a significant effect on the erosion rate of acrylic coil coatings.

62215 **APTIC NO. 84120**

Stanisavlievici, L.

CORROSIVENESS OF FLUE GASES. *(Agresivitatea gazelor de ardere). Text in Rumanian. Energetica (Bucharest), 23(3-4):104-107, April, 1975.*

The potential aggressiveness of burnt gases is considered in relation to the building materials of thermal electric power plant fuels. It is advisable to use fossil fuels with the lowest possible content of sulfur, which is more and more difficult to achieve. Anti-corrosion measures in designing and building such flues are meant to prevent destruction or danger to the flue. In the future, due to the change of fuels, the point when acid dew appears could fluctuate significantly. The necessity of increasing the height of industrial flues and of applying measures of protection against acids is stressed.

62216 **APTIC NO. 76622**

Tiano, P., R. Bianchi, G. Gargani, and S. Vannucci

RESEARCH ON THE PRESENCE OF SULPHUR-CYCLE BACTERIA IN THE STONE OF SOME HISTORICAL BUILDINGS IN FLORENCE. *Plant Soil, 43(1):211-217, Aug. 1975. 6 refs. (Presented at the Symposium on the Sulfur Cycle, Wageningen, May 1974.)*

A correlation between the presence of sulfur cycle bacteria and the quantity of gypsum in weathered stones was investigated. Fifty samples of deteriorated stones from buildings of the historic center of Florence, Italy were collected and examined. The gypsum percentage in the samples, determined by diffractometric analysis, varied between 0.5 and 10%. The sulfur bacteria ranged from 250-20,000/g of stone. It was not possible to establish a direct correlation between the gypsum content and the number of sulfur bacteria. (Author summary modified)

62217 **APTIC NO. 84033**

Trusova, V. N. and L. F. Kuz mina

NEW INSULATORS FOR POLLUTED AREAS. *(Novye izolyatory dlya zagryaznennykh rayonov). Text in Russian. Elektr. St. (Moscow), no. 11:63-65, 1975. 3 refs.*

New insulators developed in the USSR for high-voltage power lines in polluted areas are presented. The new insulators have aerodynamically favorable shape and greatly increased current leakage paths to prevent flashover. Different insulators are available for areas with dry, moist and cementing pollutants.

62218 **APTIC NO. 79642**

Ziegenhorn, K.

DAMAGE OF BUILDINGS AS CONSEQUENCE OF NATURAL VENTILATION. *(Bauschaeden als Folge natuerlicher Belueftung). Text in German. Technik, 30(4):263-266, 1975. 4 refs.*

Gradual destruction of the concrete roof over a furnace structure in which carbon disulfide is produced from coke and sulfur is described. The furnace structure has natural ventilation with louver turrets for the discharge of the waste gases and for fresh air intake through open doors and windows. The gases discharged suddenly during the charging of coke into the furnace contain carbon disulfide which is oxidized to sulfur dioxide, carbon monoxide, and soot. The SO2 discharged through the louver turrets descends and returns into the building through the open doors after forming sulfurous acid in the free atmosphere. The complete destruction of the concrete roof was due to sulfurous acid and SO2. Mechanical ventilation with higher chimneys and fresh air intake at mid-height of the building is envisaged in the reconstruction project.

1974

62219 **APTIC NO. 76305**

Curti, di Renato, Laura Cottini, and Vincenzo Riganti

DETERIORATION AND RESTORATION OF MONUMENT STONES: TECHNICAL AND ECONOMIC ASPECTS. *(Il deterioramento ed il restauro delle pietre monumentali: aspetti tecnici ed economici). Text in Italian. Inquinamento, 16(11):26-37, Nov. 1974. 50 refs.*

The deterioration of monument stones is caused by chemical and physical factors. Humidity in the air affects the condensation of water on the stone. Whereas strong rainfall tends to remove pollutants, fogs keep damaging substances in contact with the stone for long periods of time. Cutting, transportation, and installation of the stone reduce its homogeneity. Chemical alterations are mainly due to the presence of sulfur dioxide in the atmosphere; sodium chloride, in areas close to the sea, can also act as a corrosive agent. Biological agents, such as birds and microorganisms, especially sulfo-bacteria, can damage stone. Washing the stone to remove the patina is usually the first step toward conservation. The chemical reagents used must not induce the formation of soluble salts. Treatment by impregnation with organic products cannot always be guaranteed, since there is the possibility of a subsequent chemical, photochemical, or even bacterial degradation. An in-depth impregnation can be achieved by using solutions of monomers or low polymers which can penetrate the stone and polymerize inside it before the solvent begins to evaporate and to move toward the surface. It is absolutely necessary that the viscosity of the solution be kept sufficiently low to ensure in-depth penetration. Reconstruction treatment involves filling gaps in the stone s microstructure with inorganic matter, usually alkaline silicates. In general, it is preferable to maintain a vacuum or apply pressure wherever possible; otherwise, care must be taken in choosing chemical products since they significantly influence the penetration of the consolidant. The design and economics of administrative, control, and research efforts are discussed.

62220 **APTIC NO. 76279**

Kato, H., N. Hashizume, F. Ishiguro, Y. Ueda, T. Kawanaka, and A. Sato

CORROSION AND ITS COUNTERPLAN-HEAVY OIL DESULFURIZATION EQUIPMENT. *(Fushuko to sono taisaku). Text in Japanese. Sekiyu Gakkai shi (J. Japan Petroleum Inst. Tokyo), 17(11):939- 949, Nov. 1974.*

Since the first use of heavy oil desulfurization equipment in 1967, more than 30 units with a total capacity of 900,000 BPD have been built and operated in Japan. In spite of a great progress in petroleum engineering, there are still some basic problems in the design and construction of these facilities. Six cases of corrosion are presented and control measures for each are discussed. The cases include: corrosion in the heat exchanger of the stripper feed system of the Kyushu Petroleum Co.; corrosion in the heat exchanger of the combined feed and the sulfur hydrate stripper feed system of the Fuji Petroleum Co.; corrosion due to sulfur hydrate and ammonia in the high temperature and high pressure separator gas condenser of the General Petroleum Co.; corrosion cracking under strain in the cradle of the heavy desulfurization stripper SUS316L of the Japan Petroleum Purification Co.; corrosion cracking in the heat exchanger of the desulfurization system of the Koa Petroleum Co.; and cracking in the groove of the flange of the reactor of the Idemitsu Petroleum Co.

62221 **APTIC NO. 76278**

Mogi, K., K. Kawakami, and T. Otsuka

MAINTENANCE AND ITS PROBLEMS-HEAVY OIL DESULFURIZATION EQUIPMENT. *(Hozen to sono mondaiten). Text in Japanese. Sekiyu Gakkai shi (J. Japan Petroleum Inst. Tokyo), 17(11):950, Nov. 1974.*

Since the first use of heavy oil desulfurization equipment in 1967, more than 30 units with a total capacity of 900,000 BPD have been built and operated in Japan. Corrosion or erosion of materials is a basic problem. Two cases of corrosion and two examples of its control in heavy oil desulfurization facilities are discussed: corrosion of the valves of the monoethanolamine rinsing system of the Idemitsu Oil Co.; pitting in the suction pump of the potassium carbonate regeneration tower of the Idemitsu Oil Co.; neutralization rinsing of the polythionic acid responsible for corrosion cracking in the stainless steel wall of the reactor, heat exchanger, and heating furnace of the Nippon Mining Co.; and inspection and maintenance of the indirect desulfurization equipment of the Koa Oil Co.

62222 **APTIC NO. 84295**

Ottone, Claudia and Laura Cottini

CONSERVATION OF THE CHURCH OF SANTO STEFANO IN PAVIA IN A PROTECTED ENVIRONMENT. *(La conservazione in ambiente protetto delle pietre monumentali della chiesa di Santo Stefano in Pavia). Text in Italian. Inquinamento, no. 12:17-19, Dec. 16, 1974. 5 refs.*

The sandstone which constitutes the exterior stone layer of the Basilica of San Michele in Pavia has an ionic sulfate content significantly higher than that of the underlying materials. The alteration of the sandstone is due to the effect on the calcareous cement of sulfuric acid, which comes from the oxidation of sulfuric anhydride present in the urban atmosphere. The difference between the sulfate content of the protected and the exposed sandstone was significant. In view of the need for immediate action, and because of economic and technical considerations, the shielding of materials from the atmosphere is the most effective control procedure.

62223 **APTIC NO. 76038**

Petrenchuk, O. P.

REGULARITY IN THE DISTRIBUTION OF CHLORIDE CONCENTRATION IN AIR AND CORROSION OF METALS IN SEASHORE AREAS. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha. Leningrad, Gidrometeoizdat Press, 1974, 225p. 14 refs. Translated from Russian, 13p.*

Ambient chloride concentrations were measured and corrosion of metals assessed at 4 points at distances from 15 to 2000 m from the Crimean shore. Chloride concentration was dependent on wind speed, and corrosion varied with chloride concentration. Chloride concentration also varied with distance from the shore (decreasing with increased distance). Statistical analysis of these variables yielded empirical relationships (valid for this region) that permit accurate calculation of the rate of corrosion at any point within the limits of 15 to 2000 m from the coastline, given a known chloride concentration at one point.

62224 **APTIC NO. 73178**

Sera, Kotaro, Jun Hamamoto, and Hisae Kakimoto

EFFECTS OF AIR POLLUTION GASES ON ELECTRICAL MATERIALS. *(Taiki osen gasu ga denki shozairyo ni oyobosu eikyo ni tsuite). Text in Japanese. Chukoku Electric Power Co. Technical Report, no. 46:165-175, Dec. 1974.*

Air pollution conditions at the Minamiiwakuni, Shimoachi, and Nishiotera transformer substations as well as their effects on metal apparatus were studied. Sulfur oxides concentrations were measured by lead dioxide, alkali filter paper, and autosampler methods. The monthly average concentration at the Minamiiwakuni substation (PbO2) from Sept. 1972 to March 1974 ranged from 0.25 to 0.63 SO3 mg/100 sq m/day. The monthly average concentrations at the Shimoachi and Nishiotera substations (alkali filter paper method) ranged from 0.12 to 0.45 SO3 mg/sq m/day and 0.14 to 0.63 SO3 mg/sq m/day, respectively. Corrosion of metal apparatus at the Minamiiwakuni substation was very minor while that at the Shimoachi substation was rather serious. Greenish rusts were found on terminals in cubicles. An X-ray study of the rust revealed that it contained mainly sulfur compounds. Test results also showed that zinc plated materials and iron were the most easily attacked followed by copper materials.

62225 **APTIC NO. 84380**

Thomson, Garry and Raymond White

THE PH OF RAIN AND THE DESTRUCTION OF ALKALINE STONE. *Stud. Conserv., 19(3):190-191, 1974. 3 refs.*

Chalk and marble chips were exposed to acid solutions of different pH s to investigate the effect of rainwater acidity on alkaline stone. The rate dissolution for specimens in solutions having pH values comparable to urban rain (4-4.5) was between 50 and 100 times as great as the dissolution rate for specimens exposed to solutions with pH values comparable to rural rainwater (5.6). The acidity in urban rainwater appears to be due to sulfur oxide pollution.

1973

62226 **APTIC NO. 80270**

Peytchev, L., M. Pantcheva, K. Moschekov, and G. Pindev

INFLUENCE OF AGGRESSIVE FACTORS ON SOME CONTACT MATERIALS. *Illinois Inst. of Tech.,* *Chicago, Ill., Electr. Contacts, Proc. Annu. Holm Semin. Electr. Contact Phenom., 19th, Chicago, Ill., 1973, p. 100-105. 4 refs.*

The behavior of silver based contact materials, copper, aluminum, tungsten, and nickel in surroundings containing sulfur dioxide and phenol-formaldehyde was investigated. Contact resistance dependence upon contact pressure was taken as a criterion for the condition of contact elements. There is a substantial influence of surroundings containing SO2 and phenol-formaldehyde upon the contact materials behavior, particularly, increase in the contact resistance. Conductivity was completely lost in some cases. Sulfur dioxide is most harmful to Ni and its alloys, while silver and silver-cadmium are hardly affected. Phenol-formaldehyde is most harmful to W and Ni; Ag and AgCd are affected least. (Author abstract modified)

62227 **APTIC NO. 84492**

Zwernemann, Karl and Kurt Gottkehaskamp

VARIATION IN RESULTS OF EXPOSING PIGMENTED TOPCOATS OF PAINT TO INTERMITTENTLY DAMP CLIMATE WITH ATMOSPHERE CONTAINING 2.0 L SO2 ACCORDING TO DIN 50 018. *(Uber die Streuung von Ergebnissen bei der Beanspruchung pigmentierter Decklackfilme im Schwitzwasserwechselklima mit 2,0 l SO2-haltiger Atmosphaere nach DIN 50 018). Text in German. Farbe Lack, 79(2):118-124, 1973. 3 refs.*

To evaluate luster and color fastness of topcoats of paint in harsh weather, tests were made for paint samples under simulated conditions of intermittent dampness in an atmosphere containing sulfur dioxide. Testing material was placed in a Kesternich chamber at 40 C with 2.0 l gaseous SO2. Exposure time is expressed in cycles (24 hr) consisting of two phases (8 hr dampness, 16 hr ambient temperature and air). Investigations on the variability of results were conducted if a series of tests proved reproducible in Kesternich chambers of different makes; if the spatial distribution of the samples varied; and if there were variations in temperature between 35 C and 45 C with 2.0 l SO2 or in the quantity of gas between 1.5 and 2.51 l SO2 at 40 C. However, this test has been considered unsuitable by many. Qualitative results with green, yellow and organge pigments are discussed with respect to stain resistance. A suggestion is also given for a practical SO2 test on topcoats to evaluate their stability in color retention, wherein the relation between oil soot and the behavior of furnace-dried paint affects SO2 resistance of topcoats.

1972

62228 **APTIC NO. 83420**

Friehe, W.

EFFECT OF SILICON AND MANGANESE IN PLAIN CARBON STEELS ON THE WEATHER RATE IN AIR AND SEA WATER. *(Einfluss von Silicium und Mangan in unlegierten Staehlen auf die Abwitterungsgeschwindigkeit an Luft und in Meerwasser). Text in German. Stahl Eisen (Duesseldorf), 92(21):1044-1046, 1972. 5 refs.*

The effect of silicon and manganese on the corrosion rate of carbon steels in land, industrial, and maritime air, and in seawater was studied for up to 6-year exposures. Tests were made with plain carbon steel specimens containing 0 to 0.4% Si with a constant manganese content of 0.46%, and with 0.27 to 1.2% Mn with a silicon content of 0.18%. In sea air an increase in silicon content from .18 to .4% brought about a 10% decrease in the corrosion rate. An increase of manganese content of .27 to .47% did not decrease corrosion in land and maritime air, but decreased corrosion in industrial air. Increasing Mn content to 1.2% decreased all three media corrosion. Experiments were performed with seawater by three methods: a) spray of seawater, b) intermittent immersion, and c) continuous immersion. Corrosion rates were highest in the spray water zone, less in the intermittent immersion zone, and still lower in the continuous immersion zone. A lessening of mass loss due to seawater corrosion was effected by increasing Mn content from .69 to 1.20%.

1971

62229 **APTIC NO. 47144**

Bardelli, Umberto

SOME CURRENT AND FUTURE ASPECTS OF ATMOSPHERIC POLLUTION. *(Alcuni aspetti presenti e futuri dell inquinamento atmosferico). Text in Italian. Ingegneria (Italy), no. 5:311-316, May 1971.*

The effects of atmospheric pollutants on various materials and the mechanisms of the corroding action of carbon dioxide, sulfur dioxide, hydrogen sulfide, nitrogen oxide, and hydrogen chloride on marble, copper, iron, nickel, precious metals, natural and artificial fibers, paper, rubber, and paint are reviewed. The damage caused by pollutants on works of art, monuments, and buildings is inestimable and the efforts to prevent this damage are quite inadequate. Practically no material can resist atmospheric pollution coupled with humidity and sunlight, even gold foil has to be of at least 95% purity to resist corrosion. An alloy containing 69% gold, 25% silver and 6% phosphorus will corrode if exposed to a high enough concentration of H2S. Electrical insulators present a special problem with pollution causing loss of current; the advent of transistors brought new problems because they operate at such low intensities that they easily stop functioning when an oxide film forms on electrical contacts. Nylon exposed to pollution loses its resistance when in thin fibers and under tension, as in ladies stockings. Leather has a low resistance to SO2 and decomposes easily and quickly as does synthetic rubber, wool, and cotton. The effects of pollutants on works of art like frescos, sculpture, marble monuments, and buildings must be counteracted by protective films based on paraffin, bitumen, varnish, and other materials. Paintings are best protected by air conditioning.

62230 **APTIC NO. 44446**

Giles, William S. and Stanley H. Updike

INFLUENCE OF LOW LEAD FUELS ON EXHAUST VALVE PERFORMANCE. *Preprint, Society of Automotive Engineers, Inc., New York 10p., 1971. 3 refs. (Presented at the Society of Automotive Engineers, National West Coast Meeting, Vancouver, British Columbia, Aug. 16-19, 1971, Paper 710674.)*

An extensive series of tests was completed to evaluate accelerated exhaust valve seat wear which occurs in passenger car engines with lead-free gasoline. The predominate factor contributing to seat recession is vibration-induced relative motion between the valve and seat. Engine speed rather than loador temperature showed the greatest influence on accelerated wear. Various combinations of valve head shape including changes in seat angle, seat width, and valve heat stiffness were studied. Fixed rotated valves, various valve materials, face coatings, and fuel additive evaluations were also made. Reduced valve seat angles and hardened seats showed the greatest reduction in valve seat wear with lead-free gasoline. (Author abstract modified)

1959

62231 **APTIC NO. 42763**

Larrabee, C. P.

MECHANISMS BY WHICH FERROUS METALS CORRODE IN THE ATMOSPHERE. *Corrosion, 15(10):36-39, Oct. 1959. 14 refs. (Presented at the National Association of Corrosion Engineers, Annual Conference, 14th, San Francisco, Calif., March 17-21, 1958.)*

The electrochemical theory of corrosion, by which the corrosion of steels in solutions is readily explained, also is used to explain the start of atmospheric corrosion on ferrous sulfates.

The hydrogen peroxide theory and the carbonic acid theory of how iron corrodes are also mentioned. Effects of contaminants both in the atmosphere and on the steel surface are described. The part played by various alloying elements in retarding atmospheric corrosion, once a rust film is formed, is discussed. Relative effects of heavy and light deposits of sea salt on ferrous specimens are shown. (Author abstract modified)

EFFECTS-ECONOMIC

1976

62232 **APTIC NO. 83906**

Dach, Guenter and Guido Schmidt

EXPENDITURES FOR MEASURE OF ENVIRONMENTAL PROTECTION BY INDUSTRY WITH SPECIAL REGARD OF HARD COAL MINING. *(Monetaere Aufwendungen fuer Umweltschutzmassnahmen in der Industrie unter besonderer Beruecksichtigung des Steinhoklenbergbaus). Text in German. Glueckauf (Essen), 112(2):94-98, 1976. 8 refs.*

An estimate of expenses for ecological measures applied in the past and for the period of 1975-1979 with special emphasis on coal mining in West Germany is presented. At the end of 1974, industry as a whole had invested 8.3 billion dollars (in 1973 prices) for ecology. About 3.6% of this amount was spent by the coal mining industry. Its share was 44% in the field of power economy. Coal mining investments from 1960-1974 for ecological measures were higher than in other industrial branches. In 1974 alone, operational costs of industry for pollution control ran to 2.4 billion dollars, 37.5-44 million dollars for coal mining (70% for personnel and maintenance). In coal mining, 2/3 of the total cost was for air purification, waste water elimination, and ground water protection. For the latter, investments of 1 million dollars and operational expenses of 0.1 million dollars were reported. For noise control in this industry, sound absorbers were attached to machinery. In coal mining, financial expenses from 1975-1979 projected to run to 40 billion dollars for the entire industry, would be concentrated to a higher degree on air purification attributable to lower permissible emission levels and stack gas desulfurization, the cost of which could not yet be determined.

62233 **APTIC NO. 81899**

Giaquinta, A. R., T. E. Croley II, V. C. Patel, J. G. Melville, M. S. Cheng, and A. S. Uzuner

ECONOMIC ASSESSMENT OF BACKFITTING POWER PLANTS WITH CLOSED-CYCLE COOLING SYSTEMS (FINAL REPORT). *Iowa Univ., Iowa City, Iowa Inst. of Hydraulic Research, Environmental Protection Agency Contract 68-03-0430, Program Element 1BB392, ROAP 21AUZ-019, Rept. EPA-600/2-76-050, 383p., March 1976. 57 refs.*

An economic assessment of backfitting power plants with closed- cycle cooling systems is presented. The following types of closed-cycle systems are considered: mechanical and natural draft crossflow wet cooling towers, cooling ponds, and spray canals. The total cost of backfitting, in mills/kW-hr of energy delivered, depends mainly on the capital cost of the cooling system, the capital cost associated with the replacement of lost capacity, the operating costs of peaking plants built to replace the energy losses, and the excess fuel consumption of the affected units due to higher back-pressure operation resulting from the backfit. Computer programs and graphical results which can be used to make an independent assessment of the backfitting cost for a given power plant or unit at a known site are presented. (Author conclusions modified)

62234 **APTIC NO. 83025**

Rosenkranz, Rodney D.

ENERGY CONSUMPTION IN DOMESTIC PRIMARY COPPER PRODUCTION. *Bureau of Mines Information Circ., vol. 8698:1-22, 1976. 17 refs.*

An analysis of energy consumption in the domestic primary copper industry is presented. Energy consumption in domestic copper production increased nearly 60% in the last 10 yr, reaching approximately 175 trillion Btu in 1973. Recently enacted Federal and state air pollution control standards are partly responsible for the increased energy consumption by smelters and refineries. Sulfuric acid plants are being installed at many smelter operations to recover sulfur dioxide gases produced during the smelting process. New processes being utilized in the smelting and refining stages of copper production to reduce emissions include the use of electric reverberatory furnaces in combination with redesigned converters and the Arbiter process. These processes require about the same amount of energy as conventional processes. Reverberatory furnaces consume the largest amount of energy in the smelting and refining process (11,932 Btu/lb of copper). An estimated 1084 Btu is required for the removal of SO2 from the stack gases and the production of sulfuric acid.

1975

62235 **APTIC NO. 80041**

Ando, J.

NITROGEN OXIDES AND ENVIRONMENTAL ISSUE. *(Chisso sankabuts to kankyo mondai) Text in Japanese. Keidanren Geppo (J. Japan Econ. Assoc.), 23(9):582-586, Sept. 1975.*

Pollution control in industry has made great advances in recent years. The ratio of investments in pollution control related equipment to the total equipment investment was 16% in 1974 compared to 5-6% in the U. S. and other European nations, and was estimated to be about 20% in 1975. The environmental standard of nitrogen oxides is 0.01 ppm (yearly average), which is 1/5 of the 0.05 ppm of other nations. Misconceptions about the environmental standard and emission standard concerning NOx are discussed. Fundamental economic difficulties involved in flue gas denitrification are described. The general trend of air pollution control, improvement in the living environment, and responsibilities of major industries in environmental pollution control are also discussed.

62236 **APTIC NO. 79756**

Aoki, I. and T. Miyamoto

EVALUATION OF ECONOMIC LOSSES BY ENVIRONMENTAL POLLUTION: FROM SURVEYS OF THE BUSINESS SECTOR. *(Kogai ni yoru keizaiteki sonshitsu hyoka: Kigyo bumon chosa kara). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rep. Tokyo Met. Res. Inst. Environ. Prot.), no. 6:299-310, 1975.*

Questionnaires concerning environmental pollution were sent in July 1973 to 552 businesses in Metropolitan Tokyo, selected at random. Individual interviews by survey workers were conducted at the time of retrieval of the questionnaires. This survey was part of a 4-year study on pollution, conducted from 1970 to 1973. Of the 411 valid returns from the survey, pollution effects were felt by the following percentages: Air pollution 54.0; noise and vibration, 57.9; malodor, 34.8; water quality deterioration, 5.1; no pollution, 1.9. More stringent pollution regulations were desired in the following sectors: air, 69.3%; water, 39.2%; noise and vibration, 62.2%; malodor, 49.9%. Victims and non-perpetrators of pollution (70-85% of those surveyed) desired more stringent regulations. In the Eto region of Tokyo, in the years from 1968-1972, pollution casualty rates for businesses ranged from 15.6 to 41.7%, but repair rates ranged from 6.8% to 21.3%. Non-manufacturing enterprises (restaurants, public baths, pachinko parlors, etc.) had a higher repair rate. Total costs of pollution damage amounted to $6.1

million during those years, of which about $5.1 million was in non-manufacturing enterprises. Total economic losses for one year, for various sectors of the economy, calculated as a yearly average during the years 1963-1972, are: public, $29.5 million; business, $8.1 million; households, $26.1 million.

62237 **APTIC NO. 76591**

Baker, Peter W.

POLLUTION – THE LEGISLATIVE BALANCE. *Transport Eng. (London), vol. 1975:13, 15, 17, Nov. 1975.*

The two aspects of pollution control which directly affect diesel engine manufacturers are smoke and noise. Smoke from diesel engines is not harmful but is unpleasant and dirty in appearance. Legislation has been enacted in the United Kingdom to control these undesirable elements. Variation in legislative standards throughout the world presents additional complications to the manufacturer. Production specifications and component changes subsequently evolved have, in the short term, reduced manufacturing flexibility and output, while significantly increasing production cost. The legislative effect on the cost of the diesel engine is unlikely to diminish because of the high technical investment required to change environmental targets. There are major practical difficulties when attempting to confirm engine performance under normal commercial vehicle operation. Noise reduction is also discussed.

62238 **APTIC NO. 82606**

Berard, Paul

MANUFACTURERS POLLUTION ABATEMENT CAPITAL EXPENDITURES AND OPERATING COSTS (ADVANCE REPORT) 1973. *Bureau of the Census, Washington, D. C., Series MA-200(73)-1, 3p., Oct. 6, 1975.*

The first annual Pollution Abatement Expenditures Survey conducted by the Bureau of the Census revealed that capital expenditures for pollution abatement by manufacturing establishments amounted to $2.4 billion in 1973, with $1.5 billion being spent on air pollution abatement. The estimates are based on information collected from a probability sample of 17,000 manufacturing establishments selected as a subsample from the 70,000 establishment Annual Survey of Manufactures sample. The operating cost for pollution abatement activities amounted to $2.5 billion in 1973, and air pollution abatement accounted for $1.0 billion of this total. A detailed breakdown of capital expenditures for pollution abatement is given by Standard Industrial Classification codes.

62239 **APTIC NO. 73034**

Bruce, Ronald G.

THE LOW-SULFUR UNLEADED GASOLINE PROBLEM. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 6p., 1975. 3 refs. (Presented at thee Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, 750092.)*

A petroleum industry survey was conducted to determine the economic impact of reducing the sulfur in unleaded gasoline to a maximum of 100 ppm. An estimated 361 new processing units at a cost of $3.7 billion are required to meet the goal, with an additional 100,000-150,000 barrels/day of crude oil being consumed by the additional processing required to meet the 100 ppm S level. However, no increase in real refining capacity is realized. It is also probably beyond the already overloaded engineering/construction industry to complete the additional facilities required within 3 years. (Author conclusions modified)

62240 **APTIC NO. 76213**

Champagne, Jean and Brian Sawyer

LONG-TERM PLANNING OF ENVIRONMENTAL PROTECTION IN ALUMINUM WORKS. *(Planification a long terme pour la protection de l environnement dans les alumineries). Text in French. Preprint, Assoc. for Clean Air Maintenance, Quebec, 8p., 1975. (Presented at the Strategy of Air Management Conference, St-Jovite, Canada, May 25-27, 1975.)*

Different alternatives for the long-term abatement of particulate and gaseous fluorine emissions in aluminum factories in Quebec are discussed. The complete reconstruction, i.e., the shutdown of obsolete plants, and the introduction of the most advanced technology, including dry filtration or electrostatic precipitation of particulate emissions, would require an investment of about $1,000,000,000. In the long run, this solution would reduce the energy use by 15%, and also the operating costs in general. Acceptable air quality could be achieved by the use of wet filtration techniques at an investment of $100,000,000 at a rate of $25,000,000 annually. Extended modernization, involving the introduction of dry filtration or electrostatic dust precipitation, would cost $300,000.000. These latter alternative solutions would bring about a 3% increase in the energy use, and another increase in the operating costs.

62241 **APTIC NO. 83462**

Chi, Ching-Tseng, Edward C. Eimutis, William H. Hedley, and Lyland B. Mote

A METHOD FOR EVALUATING SO2 ABATEMENT STRATEGIES. *American Inst. of Chemical Engineers, New York, Dayton and Ohio Valley Sections and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Committee on Energy-Environmental Interactions, Energy Environ. Natl. Conf., 3rd, Oxford, Ohio, 1975, p. 1-15. 6 refs. (Sept. 29-Oct. 1.)*

A probabilistic approach to the economic evaluation of sulfur dioxide abatement methods of different generic types is presented. The method can be applied to a group of sources such as the nation s utility plants or industrial boilers which have a wide range of capacities and locations. Uncertainties in input variables are treated by using probability distribution functions. A common cost factor for comparing SO2 abatement methods under different control strategies is defined as the unit production cost of electricity or steam resulting from the costs of fuel, fuel handling, and either process addition/operation or boiler modification. General cost models for flue gas desulfurization and for the use of clean fuel are derived for the calculation of the common cost factor. Monte Carlo simulation is then applied to obtain the distribution, mean, and cost factor for each abatement alternative. An example is given to illustrate the application of the Wellman-Allied scrubbing process to the nation s coal fired utility power plants for meeting the overall plant SO2 emission level of 1.2 lb/million Btu. (Author abstract modified)

62242 **APTIC NO. 82729**

Cooper, Hal B. H., Jr., C. Dean Wolbach, and Vincent J. Tretter

ECONOMIC IMPACTS OF FORTHCOMING CONTINUOUS STACK MONITORING IMPLEMENTATION PROGRAMS. *Preprint, Instrument Society of America, Pittsburgh, Pa., 10p., 1975. 25 refs. (Presented at the Instrument Society of America Annual Meeting, Milwaukee, Wis., Oct. 6-9, 1975, Paper 75-722.)*

The economic impact of forthcoming continuous stack monitoring programs for gaseous and particulate emissions from industrial sources is reviewed. Capital costs for continuous stack monitoring instrumentation and related equipment are expected to range from 30-100 million dollars for the chemical industry alone in the next 10-15 yr, with a total projected cost of 400-900 million dollars for all major American industries. The major economic impact is associated with manpower training and salaries. An additional 5000-20,000 chemists, engineers, technicians, programmers, and sales and clerical personnel appear to be required by 1990 for all process industries, manufacturers and suppliers, and government regulatory agencies. (Author abstract modified)

62243 **APTIC NO. 81981**

Emmett, Brian

ENVIRONMENTAL APPLICATIONS OF INPUT-OUTPUT ANALYSIS. *Environment Canada, Ottawa (Canada), Planning and Finance Service, Rept. 3, 73p., 1975. 108 refs.*

An assessment of the problems and potential of environmental applications of input-output analysis is presented based upon a thorough examination of the model and its underlying assumptions. Extensions of input-output analysis to examine environmental problems share the drawbacks of the restrictive fixed coefficient assumption. As most environmental problems are regional in nature, regional models specific to air and water sheds must be constructed. Changing technical coefficients must also be accommodated as firms respond to changing technology and relative prices over time. An issue of major concern is the appropriateness of the input-output framework to handle ecological interrelations. The many nonlinearities and thresholds involved in ecological interactions suggest that some relationships cannot be adapted to the linear framework and must be considered outside the model. The comprehensiveness of input-output analysis and the insight it provides into economic-ecological interactions must be weighed against the restrictiveness of its basic assumptions. The value of these models can only be established by their performance over time as analytical and predictive tools. (Author abstract modified)

62244 **APTIC NO. 84394**

Ito, K.

IMPACT OF ENVIRONMENTAL CONSTRAINTS IN THE STEEL INDUSTRY. *International Institute for Applied Systems Analysis, Schloss Laxenburg (Austria), Rept. RM-75-75, 22p., Dec. 1975. 12 refs.*

The economic impact of pollution control constraints on the Japanese iron and steel industry is discussed. The Japanese iron and steel industry accounts for about 26.8% of the total sulfur oxide emissions in the country, a figure amounting to 1,604,000 tons/yr of SOx. The total pollution control investment for this industry amounts to about 15%. Studies of a model plant incorporating control measures for sulfur oxide and particulate air pollution as well as measures for water pollution reveals that the construction investment for pollution control equipment is 10.9% of the total construction costs.

62245 **APTIC NO. 84289**

Latala, Adam

ANALYSIS OF THE OPERATING COSTS OF DUST SEPARATORS FOR ELECTRIC- ARC FURNACES. *(Analiza kosztow eksploatacji instalaji odpylajacych piecow lukowych). Text in Polish. Ochrona Powietrza (Warsaw), 2(46):33-37, 1975. 9 refs.*

The cost analysis of construction and operation of dust separation devices for one 5 t (A), two 45 t (B) and three 50 t (C electric arc furnaces was calculated in order to determine their profitability. Expenses varied depending on the number and capacity of dust-separation units. The output of dust removed was: for (A), 130 t/yr; (B), 850 t/yr; and (C), 1650 t/yr. Concentrations of exhaust dust (in mg/n cu m) were about 30, 60, and 80, respectively. The total investment for the dust separators was about $126,000, $600,000, and $1,000,000. Most goes for the filtration system, costing $50,000, $170,000, and $200,000, respectively; and for electric power, at $10,000, $30,000, and $40,000, respectively. Water consumption for installations B and C average 200 cu m/hr/furnace and constituted 8.5% of the total running cost. If the rentability of the dust separators is based on a collecting output of dust of 130, 850 and 1650 t/yr for (A), (B) and (C), the monetary return is $20,000, $126,000, and $240,000, respectively. The main factor in deciding the construction of dust collecting installation is the social need to protect the environment from dust pollution.

62246 **APTIC NO. 84393**

Leung, Kenneth Chuan-kai and Jeffrey A. Klein

THE ENVIRONMENTAL CONTROL INDUSTRY. AN ANALYSIS OF CONDITIONS AND PROSPECTS FOR THE POLLUTION CONTROL EQUIPMENT INDUSTRY. *F. Eberstadt and Co., Inc., Council on Environmental Quality Rept., 142p., Dec. 1975.*

Economic prospects for the pollution control equipment industry are assessed. Topics covered include: background and legislative factors, equipment markets for stationary and mobile sources of pollution, and factors affecting the growth of such markets. The industry is represented by at least 600 participating firms. Indications are that the industry is maturing and that profit margins are stabilizing and are likely to expand in the future. During 1974, the total flange-to-flange equipment supplied by the air and water pollution control industry approximated $1.425 billion, with air pollution control accounting for $645 million of this figure. The control of stationary sources accounted for $310 million of this figure, while that for mobile sources amounted to $335 million.

62247 **APTIC NO. 83888**

Nelson, W. L.

SULFUR RECOVERY PROVIDES STEAM. *Oil Gas J., 73(47):51, Nov. 24, 1975.*

The economic advantages of using sulfur recovery plants to provide steam are described. Large S recovery plants earn a profit of $1 to $3/long ton of S. A large evolution of heat occurs, enough to generate 5400 lb of steam/long ton of S. The S recovery plants dispose of hydrogen sulfide, and are a source of valuable steam and S. Operating costs (1973) are tabulated for 100 and 1000 ton/day plants fed with 75% H2S gas (less than 2% hydrocarbons). Indexes for projection through 1977 are included.

62248 **APTIC NO. 83372**

Ney, Wladyslaw and Lars Wester

RISING OIL PRICES. CAN COAL BE AN ALTERNATIVE? *(Stigande oljepriser. Kan kol bli ett alternative)? Text in Swedish. Tek. Tidskr., no. 17:33-34, 36, 39, 1975. 6 refs.*

Economic analysis of the investment and operating costs of coal-fired versus oil-fired thermal power plants under the conditions found in Sweden is presented. While the investment costs are significantly higher for coal-fired than for oil-fired power plants, the former can be regarded as competitive because coal is even cheaper than heavy fuel oil. The installation and operation of coal-fired plants is made more expensive by the need for electrostatic precipitators and flue gas scrubbers for sulfur dioxide separation, while oil-fired power plants require no electrostatic precipitators, and they can solve the problem of SO2 emissions by the use of low-sulfur oil (with 0.3% S).

62249 **APTIC NO. 80294**

Nicklin, D. J. and S. P. Moodie

THE ECONOMICS OF POLLUTION - WHAT ARE THE OPTIONS? *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 13-19. 6 refs. (Feb. 17-21.)*

The economic impact of pollution control policies is discussed. Industry initially pays for pollution control, with the extra cost eventually being passed on to consumers by way of higher prices. Thus, there is a change in the economy s price structure as goods from cleaner industries become less expensive relative to those from industries which pollut more. An effective pollution control scheme tends to internalize the real costs of pollution, with the result being a gradual restructuring of the economy away from polluting industries and technologies. This provides for a tendency toward an equitable distribution of the costs of pollution among the present generation. A major difficulty, however, is to achieve a satisfactory distribution of the costs between different generations. (Author conclusions modified)

62250 **APTIC NO. 83697**

Rikhter, L. A., E. P. Volkov, Y. I. Gavrilov, V. G. Lebedev, and V. B. Prokhoro

COST CALCULATION OF POWER PLANT STACKS AND OPTIMIZATION OF GAS VELOCITY IN THE GAS DUCT. *(Opredeleniye stoimosti dymovykh trub TES i optimizatsiya ckorostey gazov v gazootvodyashchem stvole). Text in Russian. Teploenergetika, no. 4:12-16, April 1975. 8 refs.*

The analysis of capital outlay is presented for building high smoke stacks to facilitate the discharge of noxious gases from thermal power plants. The height of the stacks generally ranges between 120, 180, and 320 meters. The specific cost of the stack tends to decrease when it services several plants, and also when the gas velocity is increased. Therefore, it is important that optimum gas velocity be calculated. A series of formulae is presented for the calculation of the cost of smoke stacks. It is suggested that a single power plant stack is more efficient for effective air protection and lower building costs. It is concluded that 400-500 m high stacks will be built in the future to meet air protection requirements.

62251 **APTIC NO. 82194**

Sano, Hiroshi and Tsuneji Tujitani

CONSIDERATION OF STACK GAS DESULFURIZATION COST. *(Haien datsuryu kosuto ni tsuite no kosatsu). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 42(12):1-9, Dec. 1975. 7 refs.*

The stack gas desulfurization cost study for 1972-1973 is now outdated since the cost of petroleum has been raised more than four times. However the stabilized petroleum cost in 1975 makes it possible to undertake an up-to-date cost study for a stack gas desulfurization processes. The cost study for this process can be classified into construction costs, which are expressed by the treating capacity (cost/10 thousand N cu m/hr) and running costs which are expressed by volume of exhaust gas treated (cost/10 thousand N cu m) or amount of heavy oil treated (cost/kl). A cost study was conducted by the Osaka Technical Institute Research Laboratory of the Ministry of International Trade and Industry and the following related subjects are discussed: running costs (which include the direct cost, the cost for recombusting of white smoke from the desulfurization process, and the fixed cost), construction costs, the correlation between running costs and construction costs, and the selection of a stack gas desulfurization process and profitability.

62252 **APTIC NO. 82242**

Sano, Hiroshi

TECHNICAL TRENDS TOWARD NOX PREVENTION AND STACK GAS DENITRIFICATION. *(NOx boshi to haien dassho e no gijutsu doko). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 42(10):895-898, Oct. 1975.*

Regulations (June-July 1973) on emissions of nitrogen oxides from stationary sources predict that with a 10% annual expansion of energy, NOx emissions should be reduced by 30% (current goal, 130-200 ppm), by 60% (interim goal, 75-115 ppm), then 85% (final goal, 35-45 ppm). Control of NOx emissions involves control of T (temperature), O (oxygen), and C (carbon). The present NOx control technology is most suited to the 30% reduction stage. Methods include two-stage combustion, exhaust gas recirculation, addition of water, low NOx burners, conversion of fuel (from heavy oil to lighting oil, liquefied petroleum gas, city gas). Combinations of these methods need to be used at the 60% reduction level. At the 85% reduction level, economics dictates that only large-scale installations can afford denitrification equipment. (Stack gas desulfurization units involve emissions of over 50,000 N cu m/hr, at a cost of over $300,000/10,000 N cu m/hr). Installation costs for denitrification equipment are calculated to be 1.5-2 times those stack gas desulfurization. Running costs, for methods involving recirculation and addition of water, are low. As a rule, in denitrification, the cost of catalysts and electric power can be more than twice the cost of reagents used in desulfurization. Denitrification would add more than 30% to the cost, resulting from desulfurization, calculated on the basis of oil prices.

62253 **APTIC NO. 78995**

Scardino, Charles A. and G. Scott Rutherford

THE ENERGY CRISIS - OBSERVED GASOLINE PRICE ELASTICITIES IN THREE AMERICAN CITIES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-11.3.)*

Gasoline price elasticities in the cities of Boston, Denver, and Washington, D. C. are analyzed in the face of proposed gasoline taxes to reduce automobile exhaust pollution and save energy. Vehicle miles travelled, mass transit, auto occupancy, gasoline sales and availability, gasoline price, and air quality were monitored in each city through August of 1974. The difference between the expected and actual 1974 values were used to determine the price elasticity of selected variables. A price elasticity for gasoline of approximately -0.1 was computed for each city on the short run. Cross-elasticities proved not to be significant. Traffic volumes were 3-7% below the expected values for each city studied, and mass transit showed little residual effect on the energy crisis in each case. Variables found adequate to describe short-term reactions to increased gasoline taxes and/or gasoline allocations were not adequate to formulate programs for achieving and maintaining air quality since they are incapable of monitoring long-term suburban trends to the specificity required. (Author abstract modified)

62254 **APTIC NO. 76567**

Seki, Tetsuo

ENVIRONMENTAL PROBLEMS AND ECONOMIC GROWTH. *(Kankyo mondai to keizai seicho). Text in Japanese. Mita Gakkai Zasshi, 68(6):578-583, June 1975. 12 refs.*

A theoretical analysis, from a macro standpoint, of the relationship between environmental pollution and economic growth, is presented. The astounding growth of the Japanese GNP has been undeniably accompanied by environmental pollution and destruction. However, pessimistic concentration on the lowering of the quality of life, resulting in complete denial of economic growth, is dangerous and self-defeating. Equations are derived, based on the theories of Ralph C. d Arge, to formulate a model relating economic growth to environmental pollution. Economic growth and environmental quality are compatible, when, as a concomitant to growth in production, a large proportion of capital investment is allotted to recycling of pollutants and increasing the assimilative capacity of the environment. Government policies must implement these principles.

62255 **APTIC NO. 76086**

Shamel, R. E., J. K. O Neill, and R. Williams

PRELIMINARY ECONOMIC IMPACT ASSESSMENT OF POSSIBLE REGULATORY ACTION TO CONTROL ATMOSPHERIC EMISSIONS OF SELECTED HALOCARBONS (FINAL REPORT). *Little, (Arthur D.), Inc., Cambridge, Mass., Office of Air and Waste Management Contract 68-02-1349, Task 8, Rept. EPA-450/3-75-073, 76072-80, 365p., Sept. 1975. 30 refs.*

An assessement of the economic impact of possible regulatory actions to control atmospheric emissions of selected halogenated hydrocarbons is presented. Emphasis is placed on the following five halocarbons: Freon-11, -12, and -22, carbon tetrachloride, and methyl chloroform. The total emissions of these five halocarbons in the United States amounts to 560,000 metric tons, resulting from the production of 1,150,000 metric tons. A conversion time of 1-5 yr appears necessary before alternative products can be produced to replace these halocarbons. A ban on the propellant uses of Freon-11 and Freon-12 after 3 yr is expected to most strongly impact certain components of the aerosol industry, and a ban on other uses of these two halocarbons after 3 yr is expected to seriously affect major segments of the refrigeration industry.

62256 **APTIC NO. 84296**

Tevis, G. P.

PROCESS MODIFICATION FOR POLLUTION CONTROL. *(Come intervenire sui processi per combattere i inquinamento). Text in Italian. Chim. Ind. (Milan), 11(1):7-11, Jan. 18, 1975.*

Chemical installations need to develop methods of cost analysis for process modifications that are designed to reduce pollutants while preserving economic integrity. Each product and basic operation must be assessed in terms of the capital investment, research costs, and operating costs that will produce an economically feasible reduction of emissions. Social cost in values balancing the danger to the environment against the problem of economic disruption. The risk factor for proposed modifications should be assessed. The development and use of economic guidelines is illustrated by example from phthalic anhydride production.

62257 **APTIC NO. 76407**

Thompson, Russell G. and R. J. Lievano

WHAT DOES A CLEAN ENVIRONMENT COST? *Hydrocarbon Process., 54(10):73-77, Oct. 1975.*

The economic impact of standards requiring maximum removal of particulates and sulfur oxide from air emissions and zero discharge of pollutants to water, and wet cooling towers was analyzed. A large scale linear programming model of eight major energy using industries was used which allows major substitutions of alternative production processes, energy systems, water use, air emission control, and solid waste and brine management systems. Strict industrial waste discharge standards almost double the forecast price of natural gas resulting from incentives to substitute the use of clean fuel for investment in and use of air emission control equipment, primarily in electric power generation. Users who can afford to pay higher prices for natural gas bid this clean fuel away from users who cannot afford to pay higher prices for natural gas. Strict effluent standards and higher energy prices cause the use of fossil fuels in residential, commercial, and transportation sectors to decrease slightly according to demand. Sulfur dioxide and particulate emissions decrease around 97% with strict effluent standards.

62258 **APTIC NO. 80206**

Yan, Chiou-Shuang, An-Min Chung, Edward C. Koziara, and Andrew G. Verzilli

AIR POLLUTION CONTROL COSTS AND CONSUMPTION PATTERN EFFECTS. A REGIONAL ANALYSIS. *J. Environ. Econ. Manage., 2(1):60-68, Sept. 1975. 10 refs.*

The impact of air pollution control costs on income groups in the Philadelphia Region was determined through the use of an input-output model. The range of increases in consumption expenditure is fairly narrow, with the middle income group bearing the largest increase (2.9%) and the highest and lowest groups slightly lower increases (2%). All income groups share the costs of control equally which leads to a slightly regressive effect on income distribution. The sharing of the region's air quality costs by other areas is analyzed. Major pollution industries in the region are all intermediate industries except for petroleum refining, which is also an important exporter of the region. Air pollution control costs incurred in the region are shared by other regions through higher prices of intermediate goods exported and also consumer goods which are dependent on intermediate goods. (Author abstract modified)

62259 **APTIC NO. 73183**

CAPITAL SPENDING ON INDUSTRIAL POLLUTION CONTROL. *(Sangyo kogai boshi toshi no ugoki o miru). Text in Japanese. Sangyo to Kankyo (Inc. Environ.), vol. 1975:41-44, Jan. 1975.*

Survey results on industrial pollution control equipment investment conducted by the Ministry of International Trade and Industry are compiled and analyzed. The number of companies surveyed was 1359 as of Sept. 15, 1974. The total pollution control equipment investment is $3,396,000,000 for 1974 (113.4% increase over 1973) and $4,825,000,000 for 1975 (43.6% increase over 1974). Rates of increase in pollution control equipment investment are much higher compared to the rate of increase in total equipment investment, which are 33% for 1974 and 23% for 1975. The amount of pollution control equipment investment and rate of increase by the type of industries, the ratio of equipment investment for air pollution control, water pollution control, noise and vibration control, industrial waste disposal facilities and other related facilities, and ratio of pollution control equipment investment to total equipment investment are given in tabular form.

62260 **APTIC NO. 76254**

Little, (Arthur D.), Inc.

STEEL AND THE ENVIRONMENT: A COST IMPACT ANALYSIS. *347p., May 1975. 141 refs.*

The structure of the iron and steel industry is discussed, including processes and types of plants. Pollution abatement technology is assessed from the standpoint of technical feasibility, cost effectiveness, sampling and monitoring, and technical trends. Regulatory actions are discussed, including the statutory base, the structure of regulatory agencies, and current strategies. A cost impact analysis is presented, covering the direct effects of cost differences according to type, size, and age of plant, type of process, capacity utilization, and type of product. This analysis provides essential input to future analyses of economic impact. (Author abstract modified)

62261 **APTIC NO. 76277**

Osaka Prefectural Government (Japan)

INDUSTRIAL ANALYSIS RELATED TO OSAKA ECONOMICS. *(Osaka keizai no sangyo renkan bunseki). Text in Japanese. 58p., March 1975.*

The correlation between economic activity and pollution in Osaka was analyzed quantitatively by the inter-industry relations analysis method. The significance and range of uses of inter-industry relations analysis, and the composition and preparation of inter-industry relations tables are discussed. Analysis of present economic activity in terms of final demand; production activity and environmental pollution in terms of sulfur oxides and dust concentrations in 1970; and prediction of future economic activity and environmental pollution for 1981 and 1985 are given. The analytical method, preparation of the analytical model, analytical procedures for the relationship between economic activity and environmental pollution, and prediction procedures for future economic activity and environmental pollution are described.

62262 **APTIC NO. 80265**

Dept. of Labor, Washington, D. C., Bureau of Labor Statistics

IMPACT OF FEDERAL POLLUTION CONTROL AND ABATEMENT EXPENDITURES ON MANPOWER REQUIREMENTS. *Rept. 1836, 59p., 1975. 7 refs.*

A method was developed for measuring employment generated by expenditures for a specific Federal program and used to estimate the employment generated by Federal expenditures for pollution control and abatement. Much of the data generated is based on information gathered from interviews with officials of organizations engaged in pollution control activities in approximately 100 universities, nonprofit organizations, private firms, and provided by numerous Federal officials in the Environmental Protection Agency and other Federal, State, and local government agencies. Input-output tables and the industry-occupational matrix were used to analyze the data. The approximately $500 million of Federal pollution control and abatement funds in 1970 generated requirements for about 33,500 workers. Approximately 2600 were engineers, over 3800 were scientists, and 3100 were technicians. Requirements were also generated for 5300 clerical workers, 5100 craftworkers, 5300 operatives, 1700 laborers, and 1200 service workers. Respondents indicated that a fair number of skills were transferable, but they saw little incentive for hiring former aerospace or defense oriented workers since they were not having difficulty meeting manpower requirements. Generally, retraining was more practicable, and easier, for engineers than for scientists. Retraining usually means earning a graduate degree in another specialty. (Author abstract modified)

1974

62263 **APTIC NO. 76457**

Bingham, Tayler H., Philip C. Cooley, Mark E. Fogel, Donald R. Johnston, David A. LeSourd, Allen K. Miedema, Richard E. Paddock, Mayrant Simons, Jr., and Macmillan M. Wisler

COST-EFFECTIVENESS OF A UNIFORM NATIONAL SULFUR EMISSIONS TAX (FINAL REPORT). *Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-01-0426, Program Element 1HA093, Proj. 09AFD 03, Rept. EPA-600/5-74-009, 41U-757, 206p., Feb. 1974. 72 refs.*

The cost-effectiveness of a uniform national sulfur emissions tax is evaluated. A comparative statistics approach is used to project emissions in the absence of air pollution regulations and emissions and costs under several alternative tax rates for 1978. The study is confined to five major industrial sources of sulfur emissions which account for over 90% of all estimated sulfur emissions. An inventory of these sources (1970) which contains data on plant capacities and the process configurations necessary to estimate emissions and control costs is used. A computer model is developed to determine each plant s behavior under a tax, compute emissions and costs, sum the results over the industry, and print the results in tabular form. A national tax on sulfur emissions generated from these five major sources appears to be an effective means of reducing emissions. A tax rate of 5 cents/lb of sulfur emissions is estimated to result in a 53% reduction from unconstrained emission levels at a total annual cost of $1.8 billion. An 85% reduction in sulfur emissions can be achieved at a total annual cost of $4.9 billion if a tax rate of 30 cents/lb of sulfur emissions is imposed. (Author summary modified)

62264 **APTIC NO. 80358**

Cremeans, John E.

POLLUTION ABATEMENT AND ECONOMIC GROWTH: AN APPLICATION OF THE VON NEUMANN MODEL OF AN EXPANDING ECONOMY. *Naval Res. Logistic. Quart., 21(3):525-542, Sept. 1974. 10 refs.*

The von Neumann model of an expanding economy is applied to pollution abatement and economic growth. The generalized von Neumann model permits both joint products and alternative processes. Pollutants may be explicitly treated as the normal by-products of certain economic processes and clean and dirty production alternatives may be simultaneously available. Some methods for incorporating pollutants in the model are described. Techniques are given that may be used to study the relationship between pollution abatement and economic growth. Numerical examples are used to illustrate cases of direct control of processes, consumer demand for eliminated pollutant, and the limitation of total produced pollutants by exogenous constraint. (Author abstract modified)

62265 **APTIC NO. 81770**

Freeman, A. Myrick, III.

ON ESTIMATING AIR POLLUTION CONTROL BENEFITS FROM LAND VALUE STUDIES. *J. Environ. Econ. Manage., vol. 1:74-83, May 1974. 19 refs.*

A mathematical model for estimating air pollution control benefits from land value studies is presented. Each household s marginal willingness to pay for a change in the air quality is given by the slope of a function relating property values to air quality. Aggregate marginal benefits can be calculated directly by summing over all households. There is also a range of plausible assumptions which can be made about the shapes of the individual demand curves, and these assumptions lead directly to readily calculable approximations for the aggregate benefits of nonmarginal improvements in air quality. The results derived from the model refer only to a subset of the total damages due to air pollution and must be interpreted with caution. (Author summary modified)

62266 **APTIC NO. 81814**

Major, Robert L. and Ramesh Maholtra

ELECTRIC UTILITY PLANT FLUE GAS DESULFURIZATION: A POTENTIAL NEW MARKET FOR LIME, LIMESTONE, ANDD OTHER CARBONATE MATERIALS. *Limestone, 11(41):14-15, 50-57, Fall 1974. 18 refs.*

The approximate size and location of potential new markets for lime, limestone, and other carbonate materials that might develop from the widespread installation and use of wet scrubber desulfurization systems at steam electric power plants are estimated along with the potential impact of these installations on the lime and limestone industries. An additional 32.1 million tons of limestone and carbonate materials is the estimated requirement for desulfurization systems, assuming that 161,000 megawatts of electrical capacity can be equipped with flue gas scrubber systems by 1980 and assuming that all utilities select wet scrubbers using limestone or carbonate materials as the reactant. Over 75% of this potential demand is expected to be concentrated in the following eight states: Ohio, Indiana, Kentucky, Pennsylvania, Illinois, Michigan, Alabama, and Tennessee. The potential impact of wet scrubber installations on the lime and limestone industry appears to be substantial since there is little excess capacity in the industry at present. (Author conclusions modified)

62267 **APTIC NO. 83767**

Robertson, James E.

THE HIGH BTU COST OF NEW EMISSION RULES. *Paper Process., 10(5):34-39, May 1974.*

The high Btu cost of new emission rules for an unbleached kraft pulp mill were calculated. Current air emission control technology requires 10% more energy than a pulp mill designed for economic consideration only. Specific mill situations may increase this 10% to 25%. Developing technology requires the average mill energy increase for air emission control to be 13-15% more than a pulp mill designed for economic considerations. This does not take into account any sulfur dioxide or nitrogen oxides flue gas removal systems which can increase the 13-15% to above 25%. (Author summary modified)

62268 **APTIC NO. 72933**

Zimmermann, D.

HIGH EXPENDITURES BY IRON, STEEL, AND MALLEABLE IRON FOUNDRIES DUE TO INVESTMENTS AND OPERATING COSTS FOR ENVIRONMENTAL

PROTECTION. (Hohe Belastung der Eisen-, Stahl- und Tempergiessereien durch Investitionen und Betriebskosten fuer den Umweltschutz). Text in German. Giesserei (Duesseldorf), 61(10):317, 1974.

A survey conducted by the German Foundry Association among metallurgical plants in West Germany on environmentally related investments is presented. Investments in the clean air maintenance area were mainly for dust separations in cupola and electric-arc furnaces, foundries, and castings cleaning operations. Indirect investments were related to conversion of conventional to electric-arc furnaces to reduce pollutant emissions. The percentage of environmental protection-related investments increased from 5.8% or $3,300,000 annually during the 1960-1969 period to 12.7% or $11,000,000 annually, with the share of air pollution control-related investments decreasing from 75% to 66% during the same time. Air pollution control devices absorbed almost 70% of the total operating costs.

62269 **APTIC NO. 79253**

Organization for Economic Co-operation and Development, Paris (France)

ECONOMIC IMPLICATIONS OF POLLUTION CONTROL. A GENERAL ASSESSMENT. *OECD Studies in Resource Allocation 1, 79p., Feb. 1974. 29 refs.*

A macro-economic assessment of the costs of pollution control programs and their general economic policy implications in a number of OECD member countries is discussed. The pollution control expenditures over the next 5-10 yr are placed within the context of other claims on national resources to give perspective to the recent intensive and emotional debate on pollution control. The major policy and theoretical issues raised by pollution control costs include the effects on the growth of the gross national product, unemployment, and prices, the implications for the relative supply of public and private goods, the balance of payments implications, and the regional and sectional consequences. The analysis is carried out under the assumption of full utilization of resources.

62270 **APTIC NO. 80221**

Organisation for Economic Co-operation and Development, Paris (France)

ECONOMIC IMPLICATIONS OF POLLUTION CONTROL: A GENERAL ASSESSMENT. *78p., Feb. 1974. 29 refs.*

The costs of pollution control programs and their general economic policy implications are assessed in Germany, Italy, Japan, the Netherlands, Sweden, the United Kingdom, and the United States. The timing of such programs is important because transitional problems could be considerably minimized by an adequate adjustment period. Although employment levels are unlikely to be affected in the medium run, regional or sectoral unemployment problems may appear in the short run if the adjustment towards less polluting output is too rapid. Similarly, the balance of payments adjustment that may be set off by differential pollution standards among countries, or even identical standards but different environment conditions, will be easier the longer the time span available. The probable inflationary impact of pollution control measures may be minimized if the resulting cost increases are smoothly spread over time and if possible demand pressures from bunching pollution control expenditures are avoided. These pressures could be exacerbated by supply considerations in high polluting industries where capacity constraints are created as a result of pollution control programs. The full impact of government environmental programs on disposable incomes will be masked by the polluter pays principle. It is important to evaluate such effects. The polluter pays approach should improve resource allocation. Firms will restrict use of the environment as it becomes more costly, while higher prices for goods produced by high polluting industries should reduce demand. Application of the polluter pays principle will also automatically bring about the required adjustments in aggregate demand.

62271 **APTIC NO. 80258**

Harbridge House, Inc., Boston Mass.

THE ECONOMIC AND LAND USE IMPACT OF FEDERAL REGULATIONS TO REVIEW NEW INDIRECT SOURCES OF AIR POLLUTION PRIOR TO CONSTRUCTION. *Environmental Protection Agency Contract 68-01-1561, Rept. EPA 130/1-75-1-001, 356p., Oct. 1974.*

NTIS: PB-240 110

The potential economic and land use impact of the Federal indirect source regulations was investigated. The expense incurred in preparing an indirect source review application (ISR) usually is less than 0.1% of total project costs. Costs associated with construction delays include inflation and the opportunity cost when money is unavailable for new investments. Design changes to prevent violation of the carbon monoxide air quality standard are the principal source of ISR-related costs. A brief background of the regulations is presented. The potential economic impact of ISR is explored, as evidenced by the case studies and state and local experiences. The impacts discussed are basically those borne by the developer, although the same cases they fall upon the general public. Possible changes in the location and size of new developments that may result from implementation of the regulations are discussed. Administrative and procedural issues inherent in implementing ISR are discussed, including questions of timing, staffing, data reliability, regulatory interpretation, and coordination with other agencies. (Author abstract modified)

1973

62272 **APTIC NO. 81822**

Jimeson, Robert M.

THE DEMAND FOR SULFUR CONTROL METHODS IN ELECTRIC POWER GENERATION. *Advan. Chem. Ser., no. 127:33-47, 1973. 3 refs. (Presented at the American Chemical Society, Division of Fuel Chemistry and Division of Petroleum Chemistry, Meeting, 164th, New York, Aug. 29-30, 1972.)*

Projections for the supply and demand of various quality fuels and control devices necessary for meeting the requirements of Federal and state sulfur oxide regulations for electric power generation are developed. A demand for 425 million tons of coal and 565 million barrels of oil is forecast for electric generation by 1975. About 94 million tons of naturally occurring low-sulfur coal and 359 million barrels of low-sulfur oil are estimated as being sufficient for meeting air quality regulations. About 331 tons of coal and 206 barrels of oil of high sulfur content are expected to be burned in about 1350 units, each requiring stack gas sulfur dioxide removal. (Author abstract modified)

62273 **APTIC NO. 67114**

Reneker, Robert W., Robert J. Fleming, Edward H. Carson, Clifton B. Cox, Harold N. Kummer, Kenneth W. Monfort, and Floyd A. Segel

POLLUTION CONTROL COSTS AND RESEARCH PRIORITIES IN THE ANIMAL SLAUGHTERING AND PROCESSING INDUSTRIES. *National Industrial Pollution Control Council, Washington, D. C., Poultry and Animal Based Products Foods Sub-Council, 28p., May 1973.*

GPO

The cost for complying with existing and proposed pollution control regulations was surveyed by the major trade associations in the meat, poultry, and rendering industries. From 1971 to 1976 these industries estimate a total capital investment for pollution control of $222 million and a total operating and administrative cost exceeding $162 million. The major atmospheric pollutants are odor, smoke, and particulates. Using

1971 and 1972 as a base, the average annual capital investment in pollution control in these industries will increase by 40% from the base for the years 1973 through 1976. The average annual operating and administrative costs for these services will increase by 93% from the base for the same period. A minimum of 124 rendering and poultry slaughtering plants may be forced to close at a capital costs of approximately $23 million and with considerable socio-economic impact on employees and the community. These are primarily small plants located in rural areas. (Author summary modified)

62274 **APTIC NO. 76433**

Schneider, Alan M.

ELASTICITY OF DEMAND FOR GASOLINE IN THE SOUTH COAST AIR BASIN. *California Inst. of Tech., Pasadena, Environmental Quality Lab., National Science Foundation Grant GI-29726, Rept. EQL-10, 18p., Fall 1973. 1 ref.*

The elasticity of demand for gasoline (the negative ratio of the change in consumption per unit change in price) in the California South Coast Air Basin was analyzed to assess the effectiveness of gasoline price increases as part of a total strategy to reduce air pollution. Box and Jenkins linear time series methods were used to detect the change in consumption due to a 17% change in price. There was no detectable change within the 2% noise limit of the method, indicating that either the elasticity is less than 2 parts in 17 or that present tools must be further refined to detect it. (Author abstract modified)

62275 **APTIC NO. 67118**

Zupan, Jeffrey M.

THE DISTRIBUTION OF AIR QUALITY IN THE NEW YORK REGION. *Washington, D. C., Resources for the Future, Inc., 1973, 101p. 25 refs.*

The quality of air in the New York Region, a 31 county tri-state area centered on Manhattan, is examined in an attempt to determine how differing air quality affects different income groups. Estimates are also made of air quality exposure in different income groups for various land use alternatives and highway programs within the context of increasingly stringent federal emission standards. Direct air quality measurements and isopleths are provided to assign average concentrations for each of four air quality indicators (sulfur dioxide, smokeshade, settleable particulates, and suspended particulates) to the postal zone system for which income data are available. Curves for each income group and each indicator are drawn, showing the percentage of the population exposed to successively higher concentrations of each air quality indicator. In each case, the low income population is consistently exposed to higher concentrations of pollutants than the middle and high income populations, with the middle income population being exposed to higher concentrations than the high income population.

1972

62276 **APTIC NO. 67109**

Barrett, Larry Boyd

IMPACT OF AIR POLLUTION CONTROL ON GRAY IRON FOUNDRIES: AN ECONOMIC ANALYSIS. *AIChE Symp. Ser., 68(126):216-220, 1972. 2 refs.*

The economic impact of air pollution control on gray iron foundries was investigated. They emitted more than 170,000 tons of particulates in 1968 and the industry ranked as one of the top 15 polluting industries. Of firms with more than $10,000,000 in shipments, 65% have air pollution control. Smaller firms tend not to have air pollution control, and only 3% of the foundries with shipments under $.5 million operate control systems. An engineering and economic survey was made of representative foundries with pollution control. Supplemental statistics were gathered from government sources on economic and financial aspects of the industry and over a representative sample of firms. In terms of impact on profits, capital stock, and value of shipments, foundries with less than a million dollars in shipments face approximately five times the impact of pollution control than that on large foundries with shipments over $10 million. There is little evidence to suggest that air pollution control is a major burden to the existing foundries or the primary factor in the demise of other foundries. (Author abstract modified)

62277 **APTIC NO. 43359**

Tihansky, Dennis P.

A COST-ANALYSIS OF WASTE MANAGEMENT IN THE STEEL INDUSTRY. *J. Air Pollution Control Assoc., 22(5):335-341, May 1972. 16 refs.*

Recent Federal legislation on the implementation and enforcement of environmental quality standards requires an economic analysis of industrial waste treatment. A cost analysis is presented of pollution control in steelmaking at three levels of detail. The lowest level pertains to gross expenditures for equipment and its operation by nearly all American steel plants over the past two decades. The intermediate level of detail lists air and water pollution control costs in a specific steel company. Complications arising from the generation of one form of pollution from control of another are noted. At the most detailed level of analysis, treatment expenditures are examined by specific department or manufacturing process. The major elements affecting total cost-- manpower, materials and supplies, other inputs, and indirect costs--are identified along with their relative magnitudes. Finally, the effects of removal efficiency and waste effluent volume on total treatment costs are discussed.

62278 **APTIC NO. 48474**

CAPITAL INVESTMENT IN POLLUTION CONTROL. MANUFACTURING CHEMISTS ASSOCIATION 1972 SURVEY. *Ind. Wastes, 18(5):40-42, Sept./Oct. 1972.*

The total 1972 capital investment of 136 U. S. chemical manufacturers in air pollution control, water pollution control, and solid wastes treatment and disposal is shown in charts and graphs. Also indicated are projected added capital investment for pollution control, maintenance and operation costs of control facilities, annual research expenditures, and manpower assigned to pollution control. The 1972 data are compared with 1962 and 1967 data. In 1972, $1370 million will be spent on environmental management facilities in use. Another $1340 million will be invested in 1972-1975. Annual research expenditures were $8.3 million in 1962, $18.4 million in 1967, and $46.7 million in 1972.

1971

62279 **APTIC NO. 35804**

Alexander, Ike

ECONOMIC ASPECTS OF POLLUTION CONTROL IN A COPPER REFINERY. *Mines Mag. (Denver), 61(12):21-22, Dec. 1971. (Presented at Rutgers Univ. Business Conference, 23rd, New Brunswick, N. J., June 3, 1971.)*

Between 1957 and 1970, a copper and precious metals smelting and refining company spent a total of $11.5 million for pollution control and related activities. Control equipment purchased included three baghouses for dust and gases from blast furnace and converter operations in the copper smelting process, a wire furnace for smelting, and a 400-ft stack for exhaust gases. The furnace itself was equipped with a complex control system -- an afterburner, a quench tower, two wet-scrubber packed towers, and an electrostatic precipitator. Control improvements for precious metals operations were two high-energy venturi scrubbers, one wet packed tower, and automatic controls for an electrostatic precipitator for treating effluents. A prototype high-energy venturi was purchased for a pilot plant study of control of refining operations. In 1970, the

cost of operating and monitoring this equipment, much of which was ineffective, was $1.4 million.

62280 **APTIC NO. 35710**

Vars, R. Charles and Gary W. Sorenson

ECONOMIC EFFECTS OF CHANGES IN AIR QUALITY (ANNUAL REPORT). *Oregon State Univ., Corvallis Air Resources Center, National Air Pollution Control Administration Contract CPA 70-117, 58p., June 1971. 9 refs.*

NTIS: PB 201409

The specification and estimation of the pollution production functions associated with open burning of agricultural fields in the Willamette Valley are presented. To economists, the problem of accounting for the impact of this burning process on visibility appeared analogous to the problem in economics of estimating what is called a production function: production function is an analytical concept that asserts the existence of a set of fixed relationships between an output or set of outputs on the one hand and a set of inputs on the other. A pollution production function was regarded as an analytical concept that postulates the existence of a set of stable relationships between daylight visibility in particular locations in the Valley under varying present and recently past meteorological conditons (winds, inversion height, stability, and visibility are given) are recently past emission rates throughout the Valley. A statistical analysis of the variables was made. Residue removal costs for grass seed crops are given. The effects of air quality on tourist related industry were studied with a questionnaire.

1970

62281 **APTIC NO. 36621**

Challis, E. J.

CLEAN AIR-THE BALANCE SHEET: INDUSTRY S VIEWPOINT. *Nat. Soc. Clean Air Proc. Ann. Conf., p. 58-70, 1970. 2 refs. (Presented at the National Society for Clean Air, Annual Conference, Southport, England, Oct. 20-23, 1970.)*

The size, number, and complexity of factories has increased significantly in the last decade. A major technical effort and large capital expenditures within industry have been necessary to hold air pollution in check. These efforts have had some success; data indicate reduced smoke and sulfur dioxide levels in and near urban centers. Economics are causing the erection of large single plants instead of numerous smaller ones; intensified pollution problems from such large plants are discussed, including power stations and nitric acid, sulfuric acid, and ammonia plants. Air pollution control costs for several major British industries are given for 1958-1968. An industrialist must balance control costs against legal and local community standards, and is concerned about community willingness to pay extra product prices and about his competitive position vis a vis countries with lower standards. Joint discussions and consultation between industrialists, community leaders, and community/industry balance.

62282 **APTIC NO. 24309**

Mammarella, Luigi

ECONOMIC EFFECTS OF AIR POLLUTION IN ITALY: AN ATTEMPT AT OVERALL ESTIMATION. *(L incidenza economica dell inquinamento dell aria in Italia: un tentativo di stima globale). Text in Italian. In: L Inquinamento Atmosferico in Italia. Rept. 27, p. 96-114. 100 refs.*

A summary is given of the various types of damage caused by air pollution, together with the studies that have been conducted in these areas. Among the areas covered are damages to human health, works of art, agriculture and animal husbandry, tourism and recreation, ecology, buildings and other structures, losses due to expensive cleaning and restoration of buildings and garments, expenses caused by need for increased illumination, traffic congestion, substances lost during the process of combustion, and depreciation of real estate. The report of the Beaver Commission is discussed in detail, and a list of estimated costs in these various areas is given for Italy.

62283 **APTIC NO. 84388**

Stairmand, C. J.

THE TECHNOLOGY AND COST OF AIR POLLUTION CONTROL IN THE UK. *Preprint, Loughborough Univ. of Technology (England), Dept. of Chemical Engineering, 32p., 1970. 15 refs. (Presented at Solution for Pollution in an Urban Environment Symposium, Montreal, Quebec, Dec. 1970.)*

A review of air pollution control technology and costs in Great Britain is presented. Topics covered include: various regulations and legislative acts which govern air pollution control, annual expenditures for air pollution control, and policies for increasing the cost effectiveness of air pollution control. The cost of air pollution in Great Britain, which includes direct costs and damage losses, is an estimated $500-700 million/annum. Detailed capital and operating costs as well as collection efficiencies are listed for various dust control devices used by industries throughout the country.

62284 **APTIC NO. 43052**

Booz, Allen, and Hamilton, Inc., Washington, D. C., and National Analysts, Inc.

STUDY TO DETERMINE RESIDENTIAL SOILING COSTS OF PARTICULATE AIR POLLUION. *National Air Pollution Control Administration Contract CPA 22-69-103, APTD-0715, 166p., Oct. 15, 1970.*

NTIS: PB 205807

Residential soiling costs of particulate air pollution in four zones of the Pennsylvania-New Jersey-Delaware region were determined by personally administered questionnaires and interviews. The questionnaire and interview procedure consisted of six main sections: general attitudes toward soil levels, demographic and economic information, maintenance and cleaning performance information, cost of maintenance and cleaning operation estimates, neighborhood cleanliness observations by the respondent, and residence characteristics. Eleven of 27 maintenance and cleaning operations frequencies increased as air particulate level increased. The operations for which householders were most sensitive to air particulate levels were some of the low- cost regular cleaning chores. There were indications of an accelerated sensitivity to air particulate levels in the high pollution Philadelphia-Camden area.

1966

62285 **APTIC NO. 42508**

Linsky, Benjamin

DISCUSSION: HOW MUCH IS AIR POLLUTION COSTING US IN THE UNITED STATES? *Public Health Service, Washington, D. C., 1966, p. 539-544. (Dec. 12-14.)*

The undesirable effects of polluted air constitute a malifit, the opposite of a benefit. Anyone who pollutes the air is providing a private bad and under most circumstances a public bad. These terms are coined because costs, public goods, benefits, and disutilities did not provide clear enough understanding of undesirable effects, and non-renewable resource wastes of air pollutants. Use of the current estimates of cost of air pollution malifits is recommended until it seems worthwhile to allocate efforts for improvement. Problem sheds, not limited to airsheds, have varying needs for studies of malifits and control costs. More reports should be published in an authoritative way describing the interrelationships between air, liquid, and solid waste. Information on disease relationships should be established and published without waiting for undefined precision and dependability.

62286 **APTIC NO. 42526**

Wright, Colin

ECONOMIC AND SOCIAL ASPECTS OF AIR POLLUTION CONTROL -- A REVIEW. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 590-593. 1 ref. (Dec. 12-14.)*

As society becomes more urbanized, economic welfare becomes a function of externalities, i.e., goods and services not traded via the marketplace. Practitioners need to learn about benefit-cost rations, marginal-social-costs-equal-marginal-social-benefits laws, and optimal taxes. Rather than charging polluters, paying polluters for not polluting is indicated, i.e., confronting the polluter with a price for using the atmosphere which reflects its cost to society. If the firm is restricted only in the amount of pollution it can emit, then a continual search must be made for the minimum cost of accomplishment.

STANDARDS AND CRITERIA

1976

62287 **APTIC NO. 83056**

Mulvihill, J. W. and R. L. Scott

THE STATUS OF ENVIRONMENTAL REGULATIONS FOR COAL GASIFICATION AND LIQUEFACTION AS FACTORS IN THE DEVELOPMENT OF APPLICABLE STANDARD MATERIALS. *Preprint, National Bureau of Standards, Washington, D. C., 16p., 1976. 6 refs. (Presented at the Workshop on Standard Reference Materials for Coal Gasification and Liquefaction, Gaithersburg, Md., Jan. 20-21, 1976.)*

The status of environmental regulations for coal gasification and liquefaction facilities is reviewed in terms of their impact on the development of applicable standard reference materials. The potentially limiting factor in the development appropriate standard references is the lack of guidelines in terms of environmental criteria and the actual nature of the wastes to be evaluated. With no firm environmental regulations, the development of specific standard reference materials for coal conversion processes is limited to the more typical pollutants generated by refinery operations and fossil fueled steam generators. Existing Federal New Source Performance Standards for sulfur dioxide, particulate matter, hydrocarbons, and nitrogen oxides are outlined and do not appear to be adequate for covering synthetic fuel production. The Environmental Protection Agency is currently in the process of developing new standards for hydrocarbons and sulfur emissions.

62288 **APTIC NO. 82286**

Noma, Noriyuki

STANDARDIZATION OF ENVIRONMENTAL CONDITIONS AND METHODS OF IMPROVING OUR LIVING ENVIRONMENT. *(Shizenkankyo jotai no shisuka to seibutsu shihyo o riyo shita shigaichi kaihatsu to no shuho ni tsuite). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 12(1):19-25, Jan. 1976. 7 refs.*

Various factors must be considered in planning the redevelopment of a downtown area or new town development. There is no standard method for evaluating impact on the environment of a newly developed area. An assessment of the fundamental environmental conditions can be obtained by consulting the Environmental Estimated Index (EI) in conjunction with the index which determines the distribution of population. The proposed computation for EI, and the method to utilize EI with the Diversity Index (DI) to determine the distribution of the population are discussed. The environmental standard to be maintained for protection of human health and preservation of the living environment can be expressed as follows: EI equals Natural Index (NI)/Manageable Index (MI) equals 1. Other subjects of the investigation include a new city planning method using DI, and the protection of nature from pollution.

62289 **APTIC NO. 81864**

Office of Air and Waste Management, Research Triangle Park, N. C., Emission Standards and Engineering Div.

BACKGROUND INFORMATION FOR STANDARDS OF PERFORMANCE: PRIMARY ALUMINUM INDUSTRY. VOLUME 3: SUPPLEMENTAL INFORMATION. *Rept. EPA-450/2-74-020c, 50p., Jan. 1976. 4 refs.*

NTIS: PB 250667/AS

Background information dealing with performance standards for primary aluminum plants is presented. The information includes comments to proposed regulations and Environmental Protection Agency responses to these comments, updated economic impact data, and problems encountered with source sampling procedures. Growth in total domestic primary aluminum capacity and supplies is not expected to be adversely affected by the promulgated standards. The standards are estimated to require an investment cost increase at new primary aluminum plants amounting to about $95/ton of capacity (first quarter of 1975) or approximately 8% of the cost of a new uncontrolledd plant. Fluoride emission reductions resulting from the standards are expected to be about 48 lb of fluoride/ton of aluminum produced (96%) for uncontrolled plants and 11 lb/ton (85%) for plants employing the industry s current average level of control.

62290 **APTIC NO. 81865**

Office of Air and Waste Management, Research Triangle Park, N. C., Emission Standards and Engineering Div.

BACKGROUND INFORMATION FOR STANDARDS OF PERFORMANCE: COAL PREPARATION PLANTS. VOLUME 3: SUPPLEMENTAL INFORMATION (FINAL REPORT). *Rept. EPA-450/2-74-021-c, 61p., Jan. 1976. 8 refs.*

NTIS: PB 251618/AS

Background information dealing with performance standards for coal preparation plants is presented. The information includes: public comments and Environmental Protection Agency responses to these comments, updated control cost information, a reevaluation of the particulate standard for thermal dryers, and a discussion of changes in the opacity standards for coal preparation plants. The added cost of controlling pollutants from coal preparation plants as a result of the standards is expected to be less than 14 cents/ton of plant product which is only 5 cents/ton in excess of the cost resulting from the average control level required by state regulations. The inflationary impact of the standards on the price of coal is estimated to be insignificant (1% or less).

62291 **APTIC NO. 83041**

Environmental Protection Agency, Research Triangle Park, N. C.

CONTINUOUS STACK MONITORING INSTRUMENTATION NEEDS FOR THE ELECTRIC POWER INDUSTRY. *Preprint, 14p., 1976. (Presented at the Air Pollution and Industrial Hygiene Conference, 12th, Electric Power Industry, Austin, Tex., Jan. 28-30, 1976.)*

Continuous stack gas monitoring requirements set forth by the Environmental Protection Agency for the electric power industry are reviewed along with instrumentation needs. There are no monitoring requirements if a unit has a heat input capacity of less than 250 million Btu/hr. If construction of the unit began after August 1971, the unit falls under the New Source Performance Standards, whereas if the unit is an existing source and was operated at less than 30% of its rated capacity in 1975, there is no monitoring requirement. If the unit is scheduled for retirement prior to 1980, there is likewise no monitoring requirement. Monitoring criteria are also broken down by pollutant. For example, only those existing units that have greater than 1000 million Btu/hr heat input capacity, that are in an Air Quality Maintenance Area for nitrogen oxides, and that have emission rates in excess of 70% of their allowable rates need to monitor for NOx. Under the NSPS all units above 250 million But/hr heat input, except gas fired units with emissions of NOx less than 70% of their allowable rate, must monitor either carbon dioxide or oxygen levels. All non-gas fired units must monitor for opacity and sulfur dioxide. A daily fuel analysis may be substituted if the unit uses low sulfur fuel. Operational specifications can normally be met by vendor certification. However, records of the appropriate tests must be made available. Performance tests must be made on the source, and this requires full scale stack sampling for gaseous pollutants.

1975

62292 **APTIC NO. 79649**

Antweiler, H.

SEVERER GUIDELINES FOR POLLUTANTS IN THE SOVIET UNION? *(Strengere Richtlinien fuer Schadstoffe in der Sowjetunion)? Text in German. Umschau Wiss. Tech., 75(14):451-452, 1975. 12 refs.*

The maximum allowable air pollutant concentrations are often set substantially lower in the USSR than in western countries, including West Germany. These standards are determined on the basis of minimal physiological and biochemical changes in the human and animal organisms after short-term inhalation, without regard to the possible compensatory and regulatory mechanisms. These hygienic standards, determined for workplace atmosphere, are reduced by a safety factor to arrive at atmospheric concentration standards for susceptible persons. However, it is technically not feasible and economically unacceptable to abide by these standards in industrial areas and in workplaces. Therefore, unpublished technological and sanitary standards are set as a compromise between the published MAC values and the pollutant concentrations as actually encountered. These technological and sanitary standards may be around the same levels as those imposed in West Germany. The lower standards imposed in the USSR do not imply more efficient air pollution control.

62293 **APTIC NO. 84395**

Beck, David A.

PROPOSED STANDARDS OF PERFORMANCE FOR THE PRIMARY ALUMINUM INDUSTRY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 6p., 1975. 3 refs. (Presented at the Air Pollution Control Association, Southern Section, Annual Meeting, 6th, Nashville, Tenn., Sept. 17-19, 1975.)*

Proposed standards of performance for the primary aluminum industry are reviewed. As a result of testing the best controlled existing primary aluminum plants, the Environmental Protection Agency is proposing an emissions standard of 2.0 lb of total fluoride/ton of aluminum produced. This means that the sum of the primary and secondary emissions (and the anode bake plant emissions for prebake facilities) must not be greater than 2.0 lb of total fluoride/ton of aluminum produced. Opacity standards of 20% for anode bake plant emissions and 10% for potroom emissions are also proposed. The standards are designed to force the best demonstrated control technology without adversely affecting the economy of the industry.

62294 **APTIC NO. 84453**

Benson, Glenn E. and Terry M. Seiders

AIR QUALITY DETERIORATION VS. GROWTH POTENTIAL. *Preprint, Purdue Univ., West Lafayette, Ind., 20p., 1975. (Presented at the Purdue Air Quality Conference, Annual, 14th, Indianapolis, Ind., Nov. 12-13, 1975.)*

The impact of Standards for Prevention of Significant Air Quality Deterioration on a hypothetical community growth pattern is analyzed. The standards provide for allowable increases in particulate matter and sulfur dioxide over baseline air quality concentrations according to three area designations: Class I which provides for small incremental pollution increases, Class III which allows increases up to the National Ambient Air Quality Standards, and Class II which is an original designation for all areas that are below the standards. The impact of these standards is expected to be significant on community growth. Class II area pollution increments which allow for annual geometric mean and 24-hour maximum particulate levels of 10 and 30 micrograms/cu m, respectively, and for annual arithmetic mean, 24-hour maximum, and 3-hour maximum SO2 levels of 15, 100, and 700 micrograms/cu m, respectively, can be swiftly used, even with modest community growth. These increments can also be quickly used by large emission sources. Class I standards, which are more strict, are expected to severely restrict or hinder growth, and it is probable that no new sources will be permitted in a Class I area unless an existing source is replaced.

62295 **APTIC NO. 72722**

Burton, Robert M., O. L. Dowler, and Ray Ballard

THE DEVELOPMENT OF A POLLUTANT PRIMARY STANDARDS LABORATORY AND INSTRUMENTATION FOR TRANSFER OF STANDARDS TO FIELD MONITORING SITES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1975. 10 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston Mass., June 15-20, 1975, Paper 75-61.4.)*

A pollutant primary standards laboratory and instrumentation for the transfer of standards to field monitoring sites for quality control audits of the Community Health Air Monitoring Program are described. Transfer standards are designated as those that have an accuracy and stability equal to or greater than the measuring devices employed in field operations. The accuracy of all reference standards in the laboratory is directly traceable to the National Bureau of Standards and/or Environmental Protection Agency reference methods of measurement. Field audits are performed by injecting five known concentrations of each gaseous pollutant (nitric oxide, nitrogen dioxide, sulfur dioxide, ozone, and hydrocarbons) into its corresponding sensor. Usually 0, 10, 40, 60 and 80% of full scale is chosen for the concentration values. The flow of high volume particulate samplers is audited by use of the calibration orifice and its associated water manometer. Procedures and acceptable tolerances are established for the transfer of the primary standards to the CHAMP monitoring system.

62296 **APTIC NO. 76541**

Dunlop, John T.

OCCUPATIONAL EXPOSURE TO BERYLLIUM. NOTICE OF PROPOSED RULEMAKING. *Federal Register, 40(202):48813-48827, Oct. 17, 1975.*

A new occupational safety and health standard for exposure to beryllium is proposed. The proposed new standard reduces the current permissible employee exposure for an 8-hour time weighted average concentration, based on a 40-hour work week, to 1.0 microgram of Be/cu m of air, sets a 5 microgram/cu m of air ceiling limit for exposures to airborne concentrations of Be, eliminates the peak concentration level, and proposes a dermal exposure limit. The proposal provides for regulated areas, employee exposure measurements, methods of compliance, personal protective equipment and clothing, training, signs and labels, medical surveillance, and record keeping.

62297 **APTIC NO. 83129**

Feketene Narai, Katalin

ESTABLISHING EMISSION STANDARDS WITH RESPECT TO PROTECTED AREAS. *(Emisszios normaertekek meghatarozasa a teruleti vedettseg figyelembevetelevel). Text in Hungarian. Energiagazdalkodas, 16(4):163-164, April 1975.*

Differentiated air quality standards promulgated in Hungary in 1973 and mathematical methods for the determination of the pollutant emissions with respect to these standards are presented. Recreational areas and national parks are special protection zones for which the lowest pollutant concentrations are permitted, and, apart from so-called other zones, designed for industrial areas, all the rest of the country belongs in protection zones for which the concentration standards are higher than for the special protection zones. An equation of turbulent diffusion, permitting the determination of quantitative relationships between pollutant emissions and ground-level concentrations in plain areas is presented. This formula is modified for areas with sizable structures as a function of the height of the surrounding structures around punctiform emission sources (stacks) and their height.

62298 **APTIC NO. 83266**

Inoue, Takeichiro

HIGH EFFICIENCY AIR-FILTER FOR RADIOACTIVE AEROSOL. *(Hoshasei earozoru yo koseino ea firuta). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 13(5):73-80, Nov. 1975.*

A new standard (JIS-Z4812) for high efficiency air filters for radioactive aerosol (HEPA) was implemented in February 1975, which drastically revised the outdated standard of 1962 for radioactive aerosol filters. The article introduces the new standard for the HEPA in the following areas: definition of applicable filters, interpretation of idiomatic expressions, classifications and measurements and rate of flow, efficiency, material, structure, testing, standard terminology for the product, statement of specifications, and directions for use. Other matters discussed are: main objective of the revision of the standard, history of the revising of the standard, main points of revision, and precautions for operation. The HEPA of the new standard has an aerosol collection rate of 99.7% and can be used not only for aerosol but fumes and mists as well.

62299 **APTIC NO. 73365**

Kanda, Kazumi

BATTLE OF AUTOMOBILE EXHAUST GASES. *(Jidosha haigasu koboshi). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), vol. 1975: 40-43, Feb. 1975.*

The content of automotive exhaust gas emission standards, the 1975 regulations for automotive exhaust emissions, 1976 provisional emission standards, and 1978 nitrogen oxides emission standards and their impact on automobile industry are evaluated. The chaotic circumstances surrounding the formulation of the abovementioned emission standards and the lack of basic principles of emission standards which resulted in the imitation of the Muskie regulations of the U. S. are criticized. The position and complaint by nine automobile makers now reluctantly engaged in the production and sale promotion of low pollution cars are reviewed in contrast to the opinion and demand by the general public. The progress on various measures taken by automobile makers in compliance with the emission standards are described.

62300 **APTIC NO. 79708**

Legro, Stanley W.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS. DELEGATION OF AUTHORITY TO STATE OF CALIFORNIA ON BEHALF OF BAY AREA, MONTEREY BAY UNIFIED, HUMBOLDT COUNTY AND DEL NORTE COUNTY AIR POLLUTION CONTROL DISTRICTS. *Federal Register, 40(177):42195, Sept. 11, 1975.*

The Environmental Protection Agency is amending 40 CFR 61.04 pursuant to the delegations of authority for National Emission Standards for Hazardous Air Pollutants to the state of California on behalf of the Bay Area, Monterey Bay Unified, Humboldt County, and Del Norte County Air Pollution Control Districts. The amended section includes the addresses of the above districts to which all reports, requests, applications, submittals, and communications must be addressed by sources subject to the NESHAPS located within these air pollution control districts.

62301 **APTIC NO. 76341**

Nakajima, Tadao

ON TOTAL EMISSION REGULATIONS FOR AIR POLLUTANTS IN YOKKAICHI REGION. *(Yokkaichi chiiki no okeru taiki osen busshitsu no soryo kisei ni tsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 11(8):705-710, 1975. 1 ref.*

The establishment of total emission standards for nitrogen oxides in Yokkaichi is discussed. The yearly average value for emission of sulfur oxides has been set at 0.017 ppm, as the final goal. There is insufficient long-term data on nitrogen oxides in Yokkaichi, but the goal set by the Japan Environmental Agency is a yearly average value of 0.01 ppm for emission of nitrogen oxides. In 1972, yearly emissions of nitrogen dioxide in the region amounted to 29,671 tons (14,448,000 N cu m) from stationary sources, and 2253 tons (1,097,000 N cu m) from moving sources. Many unresolved problems remain, including development of denitrification equipment with its ramifications, cross- checking and refinement of data, and collection of accurate data.

62302 **APTIC NO. 76335**

Shabad, L. M.

ON THE SO-CALLED MAC (MAXIMAL ALLOWABLE CONCENTRATIONS) FOR CARCINOGENIC HYDROCARBONS. *Neoplasma, 22(5):459-468, 1975. 19 refs.*

The development of the maximal allowable doses (MAC) for benzo(a)pyrene (BAP) in the human environment of the USSR is discussed. The MAC for benzo(a)pyrene in the atmospheric air is 0.1 microgram/100 cu m and 15 microgram/100 cu m for the air of work environments. These figures are based on a study of albino random bred rats in which the dose response relationship between the amount of BAP instilled intratracheally and the induction of lung cancer was determined. The maximal non-carcinogenic dose (MNCD) of BAP induced is 0.02 mg. Other parameters used in the calculation of the MAC include: respiratory volume, the 8-hour working day by the 6-day working week, the period of working from 16-60 yr, and 100% deposition in the lungs of the inhaled BAP.

62303 **APTIC NO. 84070**

Shigemitsu, Kazuyuki and Tsuneo Tsukaya

CHARACTERISTICS OF ATMOSPHERIC ENVIRONMENTAL STANDARDS. *(Taiki kankyo kijun no tokusei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):296, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 179.)*

The environmental standard for sulfur dioxide is defined in terms of daily mean value not exceeding 0.04 ppm and 1-hour value not exceeding 0.1 ppm. Based on the assumption that air pollutant concentration distribution can be approximated by logarithmic normal distribution, the equations for geometric mean concentration, arithmetic mean concentration and exceeding probability of environmental standard were derived. The relationship between the probability of exceeding the daily mean value of environmental standard and monthly arithmetic mean concentration was obtained using the logarithmic value of standard geometric deviation as parameters. The relationship between the frequency of exceeding the 24-hour mean concentration of 0.04 ppm and frequency of exceeding hourly concentration of 0.1 ppm was also obtained. The air pollutant concentration distribution was found to be the beta distribution rather than the logarithmic normal distribution.

62304 **APTIC NO. 76344**

Shigeta, Yoshihiro

A PROPOSAL FOR MALODOR POLLUTION REGULATIONS BY REGIONAL AUTHORITIES. *(Chiho jijitai ni okeru akushu kogai kisei no ichi teian). Text in Japanese. Akushu No Kenkyu (Odor Research J. Japan), 4(21):7-11, July 1975.*

Sensory tests are suggested to supplement chemical tests (e.g., monitoring with gas chromatography), for establishment of malodor standards. Because malodor, like noise, has subjective effects on the victim, and because there are so many causes of malodor, national regulation of several substances (hydrogen sulfide, methyl sulfide, dimethyl sulfide, ammonia, trimethylamine) is not enough. Each region, with its industries, living conditions, topography, and weather conditions, has individual malodor problems, which are best regulated by local authorities. Triangulation with three odor bags is recommended as a simple method of setting up sensory tests. In conjunction with sensory tests, gas chromatography can be used to determine the nature and concentration of malodors, and thus establish malodor standards which are suitable to the locality.

62305 **APTIC NO. 84488**

Stern, Arthur C.

STANDARDS AND REGULATIONS CONCERNING SULPHUR AND SULPHUR COMPOUNDS. *Economic Commission for Europe, Senior Advisers to ECE Governments on Environmental Problems, Desulphurization Fuels Combustion Gases, Semin. 2nd, Washington, D. C., 1975, 13p. 2 refs. (Nov. 11-20.)*

An international survey of air quality, emission, and fuel standards for sulfur compounds is presented. Air quality standards exist for the following sulfur compounds: carbon disulfide, dimenthyl disulfide, methyl sulfide, hydrogen sulfide, intrathion, lead sulfide, malathion, methyl mercaptan, methyl parathion, sulfation, sulfur dioxide, sulfuric acid, suspended sulfate, thiophene, and total reduced sulfur. Emission standards also exist for the following sulfur compounds: acid gases, acid particles, carbon disulfide, carbon oxysulfide, dimethyl sulfate, methyl sulfide, dimenthyl sulfoxide, hydrogen sulfide, mercaptans, organic sulfides, sulfur compounds (as such), sulfur dioxide, sulfur oxides, sulfur trioxide, sulfuric acid, thiocresol, thioether, thiophenol, and total reduced sulfur. A detailed tabulation of countries having standards for sulfur compounds is provided along with range of each standard.

62306 **APTIC NO. 79241**

Strelow, Roger

A REVIEW AND ANALYSIS OF THE GOOD FAITH OF THE AUTOMOBILE INDUSTRY IN ATTEMPTING TO COMPLY WITH THE STATUTORY 0.4 NOX STANDARD. A REPORT TO THE SENATE PUBLIC WORKS COMMITTEE, U. S. CONGRESS. *Environmental Protection Agency Report, 118p., May 9, 1975. 10 refs.*

An evaluation of efforts made by the automobile industry in meeting the nitrogen oxide statutory emission standard of 0.4 g/mi is presented. The automotive industry is not in most cases combining all of its best emission control systems on test vehicles and is not fully exploring every reasonable technical alternative with potential for achieving the desired NOx emission level. Some manufacturers are redirecting their alternate engine problems toward a 2.0 g/mi NOx level rather than the 0.4 g/mi level in view of the present reconsideration by the Environmental Protection Agency of the need for an 0.4 g/mi NOx standard. (Author summary modified)

62307 **APTIC NO. 73364**

Uehara, Akira

TIGHTENING THE AUTOMOBILE EMISSION CONTROL. *(Jidosha haigasu kisei no kyoka ni tsuite). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), vol. 1975:24-30, Jan. 1975.*

The intermediate report published in October 1972 by thhe Central Pollution Control Council is the base for the 1975 and 1976 regulations for automotive exhaust emission. The mechanism of automotive emission standard and circumstances surrounding the formulation of the 1975 and 1976 emission standards are discussed with excerpts from the intermediate report concerning the long range policy making on maximum allowable concentration of pollutants in automotive exhaust gas. According to the 1975 emission standard, the average emission quantity per 1 km of driving is 2.1 g for carbon monoxide, 0.25 g for hydrocarbons, and 1.2 (0.25 g by the 1976 emission standard) for nitrogen oxides. The present status of technical developments concerning pollution control, the modification of engines for NOx emission control, cleansing devices for exhaust gas, and modification of gasoline fuel are reviewed. Various techniques for NOx reduction are described with advantages and problems involved.

62308 **APTIC NO. 79714**

Winkler, Klaus

UP FOR DISCUSSION: IMMISSION LIMITS FOR THE PREVENTION OF ODORS. *(Zur Diskussion gestellt: Immissionsgrenzwerte zur Verhinderung von Geruchsbelaestigungen). Text in German. Wasser Luft Betrieb, 19(7):411, 1975. 4 refs.*

A proposal to set the MAC value for hydrogen sulfide in the air at 0.0005 mg/cu m is discussed. Such a MAC value would be both unrealistic and unnecessary, as the background concentration lies at 0.002 mg/cu m, well below the odor threshold. Against an experimentally established odor threshold value of 0.003 mg/cu m, hydrogen sulfide is practically perceived at a concentration of 0.03 mg/cu m. The maximum allowable one-hour concentration of hydrogen sulfide is recommended to be set at five times the odor threshold value to arrive at a level at which no odor is perceived.

62309 **APTIC NO. 73367**

Environmental Protection Agency (Japan), Div. of Air Pollution Control

PRESENT STATUS OF NITROGEN OXIDES EMISSION CONTROL TECHNIQUES FOR STATIONARY SOURCES. *(Kotei hasseigen ni kakaru chisso sankabutsu haishutsu boshi gijutsu no kaihatsu genjo). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 11(2):95-99, Feb. 1975.*

The present status of nitrogen oxides emission control techniques is reviewed. The environmental standard for nitrogen dioxide was set at 0.02 ppm in May 1973. To reach this target value within the given time period an enforcement procedure was formulated based on the available and feasible control techniques and concentrating on stationary emission sources. The description of NOx emission standards, the required reduction rate in NOx emission concentration, and allowable NOx emission concentration to meet environmental standards are given. The intermediate target date and designated cities are listed. The formation of NOx by combustion and mechanism of atmospheric pollution by NOx are reviewed with the formation mechanism of nitric oxide, atmospheric conversion of nitric oxide to NO2, reaction of NO with ozone, and the formation mechanism of peroxides.

62310 **APTIC NO. 75208**

Office of Air and Waste Management, Research Triangle Park, N. C., Emission Standards and Engineering Div.

STANDARD SUPPORT AND ENVIRONMENTAL IMPACT STATEMENT: EMISSION STANDARD FOR VINYL CHLORIDE. *Rept. EPA-450/2-75-009, 536p., Oct. 1975. 141 refs.*

NTIS: PB 249703/AS

Background information leading to the development of a proposed national emission standard for vinyl chloride under the authority of section 112 of the Clean Air Act is presented. The information includes: industrial sources of vinyl chloride, control technology applicable to these sources, the proposed standard and the rationale for its selection, alternative approaches for regulating vinyl chloride, environmental and economic impacts of the proposed standard and alternative control levels, and other Federal or state regulations which apply to vinyl chloride or to plants which emit vinyl chloride. The proposed standard is expected to reduce vinyl chloride emissions from typical ethylene dichloride-vinyl chloride plants by about 94% and from typical polyvinyl chloride plants by about 95%.

62311 **APTIC NO. 75366**

Environmental Protection Agency, Atlanta, Ga., Regional Office IV, Argonne National Lab., Ill., Energy and Environmental Systems Div., and Office of Air and Waste Management, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

IMPLEMENTATION PLAN REVIEW FOR TENNESSEE AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT. *Office of Air and Waste Management Interagency Agreement EPA-IAG-D5-0463, Rept. EPA-450/3-75-041, 22p., April 1975.*

NTIS: PB 242022/AS

A review of Tennessee s implementation plan to determine if total suspended particulate and sulfur dioxide regulations for stationary fuel combustion sources are overly restrictive is presented in compliance with the Energy Supply and Environmental Coordination Act of 1974. Violations of the particulate National Ambient Air Quality Standards are reported for all Air Quality Control Regions in the state, and thus there appears to be little margin for relaxing particulate fuel combustion emission regulations. Modeling results for major fuel combustion sources in the Middle Tennessee Interstate AQCR indicate a potential for SO2 regulation relaxation in all areas except in the vicinity of the Johnsville Steam Plant in Humphreys County. Reported air quality data reveal the potential for regulation revision in the Metropolitan Memphis, Tennessee Valley-Cumberland Mountains, Chattanooga, and Western Tennessee AWCRs. However, since only limited modeling data are currently available for these regions, a detailed analysis is necessary to determine the degree of relaxation and its consequences in clean fuels savings. (Author summary modified)

1974

62312 **APTIC NO. 71506**

Cobb, John C.

STANDARDS FOR AIR POLLUTANTS FOR DENVER. *In: Carbon Monoxide and the People of Denver. Miriam Orleans and Gilbert F. White (eds.), Boulder, University of Colorado Institute of Behavioral Scicen, 1974, Chapt. 1.1, p. 3-5.*

Air pollution standards for Denver, Colorado are discussed in relation to the city s high altitude. The primary air quality standards set by the Environmental Protection Agency are expressed in quantity of pollutant per cu m of air at standard sea level pressure (760 mm mercury) and are not applicable to Denver s lower air pressure. The effects of carbon monoxide on heart and brain function, for example, are similar to and additive with the effects of hypoxia from low air pressure at high altitude. Thus CO standards for Denver should be lower to make up for the oxygen deficiency. Likewise, ozone standards should also be revised downward for Denver since cosmic ray radiation, which is more intense at Denver s altitude, is capable of additively reacting with ozone to cause chromosome damaging effects. On the other hand, standards for pollutants which act as irritants to the skin and eyes (e.g., photochemical oxidants) need to be revised upwards since such irritant gases are expanded at Denver s low pressure such that their concentration in air is less. This does not hold for lung irritants, however, since larger volumes of air must be inhaled at high altitude.

62313 **APTIC NO. 79287**

Dervay, John R., II

A CRITIQUE OF INCINERATION, APPLICABLE CODES, AND TESTING. *In: Industrial Odor Technology Assessment. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 17, p. 277-287. 2 refs.*

Problems involved with the source testing of incinerators are reviewed. At least six different incinerator emission standards are used throughout the United States, and there are no conversion factors for relating one of these emission bases to another. In view of the expense associated with on-site testing of incinerators, the Environmental Protection Agency and some states accept representative incinerator testing. However, if the measured emission from a representative test is not substantially below the applicable emission code, some air pollution control officials may not approve an incinerator line of geometrically similar incinerators. Additionally, the requirements for representative testing vary considerably between states. Another problem associated with incinerator testing is the fact that at least four particulate sampling trains are specified for use in testing an incinerator: the EPA Method 5, the American Society of Mechanical Engineers PTC-27, the American Society for Testing Materials D-2928-71, and the Incinerator Institute of America T-6 procedures. The most widely accepted is that promulgated by the EPA.

62314 **APTIC NO. 79255**

McCutchen, Gary D.

NEW SOURCE PERFORMANCE STANDARDS, PRESENT AND FUTURE. *In: Air Pollution Control and Industrial Energy Production. Kenneth E. Noll, Wayne T. Davis, and Joseph R. Duncan (eds.), Ann Arbor, Mich., Ann Arbor Science, 1974 (?), Chapt. 2, p. 5-40. 60 refs.*

The legislative history of new source performance standards (NSPS) is reviewed. These standards are expected to play an important role in maintaining air quality, preventing significant deterioration, controlling noncriteria pollutants, and hastening the development and application of control technology. The Environmental Protection Agency has promulgated NSPS for twelve source categories, and standards for a total of approximately 40 categories are expected to be promulgated or proposed by the end of 1975. Standard-setting priorities will be based on the expanded role envisioned for NSPS. Nitrogen oxides and hydrocarbon sources, emerging industries, and large sources are considered important. New Source Performance Standards encourage the improvement of existing control technology and radically new approaches to air pollution problems. Control of stationary sources may consume less energy than would be used to counter the effects of that pollutant in the atmosphere. The EPA proposes to further strengthen NSPS by seeking authority to set equipment standards when emission standards prove impractical, and to provide for exceptions to the NSPS for facilities attempting pioneering research in control techniques. New Source Performance Standards can significantly reduce air pollution emissions by requiring the best control of new facilities. They appear to constitute the preferred approach to control of fluorides, and may also be utilized for lead and other pollutants.

62315 **APTIC NO. 82785**

Walsh, George W.

EMISSION STANDARDS FOR PARTICULATES. *J. Air Pollution Control Assoc., 24(12):1142-1143, Dec. 1974.*

Problems encountered by the Environmental Protection Agency in setting New Source Performance Standards for particulate emissions are reviewed, with particular emphasis on the prediction of baghouse efficiency. Since performance standards must reflect the application of the best system of emission reduction, there is a need to delineate control system performance as a function of raw material characteristics, process variables, and collector design parameters. The problem of adequately defining baghouse efficiency is particularly troublesome. Current data are too general to predict the effects of process changes, alterations in filter cleaning cycles, and variations in testing time.

1972

62316 **APTIC NO. 83411**

Heuss, J. M., G. J. Nebel, and J. M. Colucci

A FURTHER RESPONSE TO EPA S DISCUSSION OF NATIONAL AIR QUALITY STANDARDS FOR AUTOMOTIVE POLLUTANTS: A CRITICAL REVIEW. *Preprint, General Motors Corp., Warren, Mich., Fuels and Lubricants Dept., 14p., 1972. 13 refs.*

A critical analysis of rationale used by the Environmental Protection Agency for setting National Air Quality Standards for automotive pollutants is presented. Although air quality standards are based on published air quality criteria documents, the step from air quality criteria to air quality standards has never been documented. Primary and secondary standards for carbon monoxide, nitrogen dioxide, hydrocarbons, and photochemical oxidants are the same, suggesting that the EPA cannot anticipate any adverse effects at concentrations below the present standards. This in turn indicates that the primary standards provide more protection than is necessary.

62317 **APTIC NO. 82708**

Kowalski, Zbigniew

MAXIMUM PERMISSIBLE CONCENTRATIONS OF TOXIC SUBSTANCES IN THE AIR. *(Zagadnienia najwyzszych dopuszczalnych stezen toksycznych substancji w powietrzu . Text in Polish. Chromatogr. Gaz. Szczegolnym Uwzglednieniem Anal. Powietrza, vol.:165-181, 1972.*

The contents of lists of maximum permissible concentrations of toxic substances used by industry in the air, published from 1933 until the present in the U. S. and abroad, are reviewed. The established permissible values generally constitute a middle ground between hygienic requirements and the technical possibilities of industry. Maximum possible concentrations have not yet been determined for compounds characterized by carcinogenic, allergic, and mutagenic action. At present the two basic lists of maximum permissible concentrations are those of the U. S. and the Soviet Union, their differences reflecting distinctions in methodology and interpretation of test results.

62318 **APTIC NO. 75919**

Lyarskiy, P. P., N. A. Pavlovskaya, and Y. T. Kapitanov

JUSTIFICATION OF PERM!SSIBLE STANDARDS OF SOLUBLE COMPOUNDS OF TH232, NATURAL THORIUM, RA232 AND TH228 IN THE AIR OF FACTORIES. *(K obosnovaniyu dopustimykh norm rastvorimykh soyedineniy Th232, toriya yestyestvennogo, Ra228 i Th228 v vozdukhe proizvodstvennykh pomeshcheniy). Gigiena i Sanit., 37(8):53-57, 1972. 9 refs. Translated from Russian, 7p.*

Maximum permissible concentrations and average annual permissible concentrations are calculated for soluble compounds of thorium in factory air by taking into account the metabolism of the parent radionuclide and its daughter products and the retention and absorption of thorium in the lungs and other body tissues. The calculated MPC and APC standards for soluble compounds of natural thorium correspond to recommendations of the Standards of Radiation Safety Committee in the USSR and do not require revision. Standards for soluble compounds of Th232 and Th228 can be increased 4.7 and 6.7 times, respectively, while those for radium 228 can be relaxed by about 40-fold according to the calculations.

62319 **APTIC NO. 48395**

Sidorenko, G. I. and N. A. Pinigin

POSSIBLE WAYS TO ACCELERATE DEVELOPMENT OF MAXIMUM PERMISSIBLE CONCENTRATIONS OF ATMOSPHERIC POLLUTANTS. *(O vozmozhnykh putyakh uskorennoy razrabotki PDK atmosfernykh zagryazneniy). Gigiena i Sanit., 37(3):93-95, March 1972. 11 refs. Translated from Russian. 6p., 1972.*

Despite advances in the hygienic standardization of atmospheric pollutants, there is a considerable discrepancy between practical requirements and the establishing of standards. Accelerated methods of determining maximum permissible concentrations of atmospheric pollutants are reviewed. The correlation analysis method includes calculation of the daily mean MPC on the basis of analyzing data of industrial toxicology and the practical use of MPC of a substance in industrial conditions; formulas based on correlation and regression analyses and the physical and chemical properties and toxicity of the substances; development of a provisional single MPC; and development of the daily mean MPC based on studies of the dose-time dependence in laboratory experiments.

62320 **APTIC NO. 48747**

ESTABLISHMENT OF ENVIRONMENTAL STANDARDS FOR PREVENTION OF AIR POLLUTION BY CARBON MONOXIDE. *(Issanka tanso ni yoru taiki osen boshi no tame no kankyo kijun no settei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 7(4):744-761, 1972. 4 refs.*

It is estimated that the total number of automobiles in 1973 will be over 20 million, which is twice the number in 1968. The total amounts of carbon monoxide, nitrogen oxides, and hydrocarbons discharged from airplanes, automobiles, and industries reached to 5,500,000 t/yr, 1,200,000 t/yr, and 1,100,000 t/yr in 1967, respectively. The standard of CO concentration in the exhaust gas from a new domestic passenger car is at 2.5% during a running condition, according to the regulation effective Sept. 1969. Measurements of CO concentrations at different locations in Tokyo revealed that the concentration decreased at one location from 1967 to 1968, while it increased from 1964 to 1968. At one location, 21.1% of the days in 1967 had a CO concentration higher than the environmental standard of a 24-hour average of less than 10 ppm.

62321 **APTIC NO. 49058**

Ministry of International Trade and Industry (Japan) Bureau of Heavy Industries

THE INSPECTION STANDARDS FOR DUST COLLECTION APPARATUS EQUIPMENT. *(Kogai boshiyo shujin sochi no kensa kijun). Text in Japanese. 23p., Oct. 1972.*

The inspection standard for dust collectors used in pollution prevention for the separation of solid particles from flue gas, excluding the apparatus for harmful substances such as lead and cadmium, is discussed. The factors to be measured which indicate the characteristics of the apparatus include the temperature, flow rate, dust content, and static pressure of gas at entrance and exit, gas composition, pressure loss, dust collection efficiency or transmittance, amount of liquid used, and amount of waste water discharged. The measurement of gas temperature is based on JIS Z8705 and 8704 method and the analyses of gases are based on JIS K 0103, 0104, 2301 and JIS Z8808 methods.

1971

62322 **APTIC NO. 49884**

Fri, Robert W.

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES. PROPOSED STANDARDS FOR FIVE CATEGORIES. *Federal Register, 36(159):15704-15722, Aug. 17, 1971. 31 refs.*

A proposal for standards of performance for fossil-fuel fired steam generators, incinerators, portland cement plants, nitric acid plants and sulfuric acid plants, including particulate matter, nitrogen oxide, and sulfur dioxide emission standards, test methods and procedures, as well as emission monitoring procedures, is presented. The SO2 emission standard proposed for fossil-fuel fired steam generators requires a maximum of 0.8 lbs/ 1,000,000 Btu as a maximum 2-hour average for liquid, and 1.2 lbs/1,000,000 Btu for solid fuel. The proposed nitrogen oxides emission standards for gaseous liquid, and solid fuels are 0.20 lbs, 0.30 lbs, and 0.70 lbs/1,000,000 Btu as a maximum 2-hour average, and expressed as nitrogen dioxide. The particulate matter emission should not exceed 0.20 lbs/1,000,000 Btu heat input, and the emitted smoke should not be darker than shade designated as No. 1 on the Ringelmann Chart. The particulate matter emission from incinerators should not exceed 0.01 g/standard cu ft. The particulate discharge from portland cement kilns and clinker coolers is limited to 0.30 lbs and 0.10 lbs/ton of feed, respectively. The nitrogen dioxide emission from nitric acid plants should not exceed 3 lbs/ton of acid produced. The proposed SO2 emission standard for sulfuric acid plants is 4 lbs/ton of acid produced. Methods proposed for the determination of stack gas velocity, volumetric flow rate, carbon dioxide, excess air, dry molecular weight, stack gas moisture content, particulate matter, SO2, and sulfuric acid mist are described.

62323 **APTIC NO. 35820**

Ruckelshaus, William D.

ENVIRONMENTAL PROTECTION AGENCY. CALIFORNIA STATE MOTOR VEHICLE POLLUTION CONTROL STANDARDS: NOTICE OF INTENTION TO WAIVE FEDERAL PREEMPTION AND OPPORTUNITY FOR PUBLIC HEARING. *Federal Register, 36(211):21001, Nov. 2, 1971.*

Under section 209(a) of the amended Clean Air Act, states and other political subdivisions cannot adopt or enforce any standard relating to control of emissions from new vehicles. No state shall require certification or inspection of new model vehicles. Exceptions to these prohibitions are permitted in the case of state standards (other than crankcase emission standards) adopted prior to March 30, 1966. Application of the provisions in section 209(a) will be waived with respect to California fuel evaporative emission standards and approval procedures for 1973 and subsequent model year gasoline engines over 6000 lbs gross vehicle weight.

62324 **APTIC NO. 35822**

Ruckelshaus, Willian D.

ENVIRONMENTAL PROTECTION AGENCY. CALIFORNIA STATE STANDARDS. WAIVER OF APPLICATION OF CLEAN AIR ACT. *Federal Register, 36(233):23092, Dec. 3, 1971.*

The Clean Air Act, as amended, prohibits states and other political subdivisions from adopting or enforcing any standards relating to the control of emissions from new motor vehicles. No state shall require certification or inspection of new model vehicles. The prohibitions can be waived, however, in the case of states who adopted standards (other than crankcase emission standards) before March 30, 1966. Therefore, the prohibitions do not apply to the California fuel evaporation emission standard and approval procedures for 1973 and subsequent model gasoline engines over 6000 lbs gross vehicle weight.

1969

62325 **APTIC NO. 41247**

Fiserova-Bergerova, V.

CARBON DISULFIDE. *In: Documentation of MAC in Czechoslovakia. Czechoslovak Commission for MAC, Prague, p. 36-39, June 1969. 15 refs.*

Carbon disulfide is mainly a nervous system poison which may also cause psychic disturbances. It is also suspected of sclerotizing blood vessels. Maximum allowable concentrations in different countries range from 10 to 60 mg/cu m. The suggested MAC values for Czechoslovakia are 30 mg/cu m (mean) and 150 mg/cu m (peak). The findings of various investigators are noted.

62326 **APTIC NO. 41233**

Marhold, J.

ACROLEIN. *In: Documentation of MAC in Czechoslovakia. Czechoslovak Commission for MAC, Prague, p. 3-4, June 1969. 2 refs.*

Acrolein is an extremely irritating substance. Maximum allowable concentrations in different countries range from 0.25 to 11.6 mg/cu m. The suggested MAC values for Czechoslovakia are 0.5 mg/cu m (mean) and 1.0 mg/cu m (peak). The findings of several investigators are noted.

62327 **APTIC NO. 41308**

Marhold, J.

NITROTOLUENE. *In: Documentation of MAC in Czechoslovakia. Czechoslovak Commission for MAC, Prague, p. 124, June 1969. 1 ref.*

Nitrotoluene is absorbed in the skin. Maximum allowable concentrations in different countries vary from 5 to 30 mg/cu m. The suggested MAC values for Czechoslovakia are 5 mg/cu m (mean) and 25 mg/cu m (peak). The findings of several investigators are noted.

62328 **APTIC NO. 41309**

Marhold, J.

NITROUS FUMES. *In: Documentation of MAC in Czechoslovakia. Czechoslovak Commission for MAC, Prague, p. 125-126, June 1969. 5 refs.*

Nitrous fumes are very irritating; the main danger is the formation of lung edema. Chronic poisoning by nitrous fumes is not usually described. Maximum allowable concentrations in different countries vary from 5 mg/cu m (N2O5) to 20 mg/cu m (NO). The suggested MAC values for Czechoslovakia are 10 mg/cu m (NO3-mean) and 20 mg/cu m (NO3-peak). The findings of various investigators are noted.

1966

62329 **APTIC NO. 42544**

Larsen, Ralph I.

FUTURE AIR QUALITY STANDARDS AND INDUSTRIAL CONTROL REQUIREMENTS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 199-204. 10 refs. (Dec. 12-14.)*

Public opinion, generally, demands that the quality of ambient air should be such that the health of even sensitive or susceptable segments of the population will not be adversely affected, and that pollutants should not be allowed to reach concentrations that will cause a nuisance, such as unpleasant tastes or odors; injure animals, ornamental plants, or agricultural crops; or significantly reduce visibility, i.e., be a hazard to transportation. The consensus is not clear on other effects, e. g., damage to fabrics, corrosion of metals, damage to other materials, or obscuring natural scenery. It is safer to decide how many times per year a certain concentration should be allowable. By themselves, air pollutant concentrations mean little. They take on meaning only when compared with the yardstick of effects they produce. Many air quality standards are designed to keep pollutant concentrations below the odor threshold. USSR scientists recommend levels that will prevent the first detectable physiological response and the levels are usually lower than those of other countries.

62330 **APTIC NO. 42569**

Maga, John A.

DISCUSSION: AIR QUALITY CRITERIA AND STANDARDS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 469-471. (Dec. 12-14.)*

The use of air quality standards is expected to increase, but uniform nationwide standards should not be adopted for all pollutants. The Federal government should provide the criteria for local and intrastate agencies; interstate control is also a Federal responsibility. Effective control is at present, hampered by the lack of standards and enforcement procedures. Although local agenices lack the resources needed to define criteria and set standards, they will be responsible for most control programs.

62331 **APTIC NO. 42531**

Middleton, John T.

FUTURE AIR QUALITY STANDARDS AND MOTOR VEHICLE EMISSION RESTRICTIONS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 45-54. 17 refs. (Dec. 12-14.)*

The greatest degradation of air quality occurs when air is used to support combustion. The large number of states subject to air pollution episodes, their grouping into areas of social and industrial patterns, the regional aspect of many airsheds, and their frequent multistate involvement and simularity of environment all suggest the need for setting national air quality standards for the protection of public health, property, and the quality of the air resource. Uniformity of standards is also desirable because of population mobility and the regular use of motor vehicles for interstate transport of people and goods. Air quality standards, motor vehicle pollution control, improved standards for carbon monoxide, hydrocarbons, nitrogen oxides, sulfur oxides, fuel additives, odors, and smokes, and standard efficiencies are examined.

62332 **APTIC NO. 42570**

Prindle, Richard A.

AIR QUALITY CRITERIA AND STANDARDS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 465-468. (Dec. 12-14.)*

Criteria and standards offer a means for dealing rationally with air pollution problems. The derivation of criteria, the establishment of standards, and the fixing of emission limitations is the logical approach to the solution of the air pollution problem. The criteria will indicate the damage associated with specific levels of pollution during various time periods. These criteria are expected to be used as guides for the development of stnadards. The establishment of ambient air standards and the development of emission standards applicable to individual sources of pollution should be the first step. Enforcement is essentially a routine function.

62333 **APTIC NO. 42547**

Stead, Frank M.

FUTURE AIR QUALITY STANDARDS AND REFUSE DISPOSAL OPERATION RESTRICTIONS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 275-280. (Dec. 12-14.)*

Air pollutants do not sort themselves out neatly according to kinds of effects, but in order to protect the public they must be thought of in terms of effects. The United States has no national and orderly set of standards for the ambient air. Adverse effects are those that impair the scenic vista. The serious level standard is the threshold of health impairment. The emergency level is a public health disaster standard. The implications of an activity such as refuse disposal can be measured or estimated differently and can be considered unimportant by one standard and disastrous by another. The crux of the matter rests on whether the preservation of human comfort, protection of human health, and the prevention of property damage constitute the total objectives of the air pollution program, or whether the preservation of the scenic values of the environment is the ultimate objective.

62334 **APTIC NO. 42561**

Sussman, Victor

FUTURE AIR QUALITY STANDARDS AND STATIONARY COMBUSTION CONTROL REQUIREMENTS. *Public Health Service, Washington, D. C. Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 124-127. (Dec. 12-14.)*

Existing air pollution control regulations with respect to stationary combustion, primarily power generation, must be reexamined. Regulations to limit emissions and thereby control community concentrations must be integrated with continuous monitoring and meteorological data. Very few regulations of this type have been enacted. The establishment of standards does not provide the basis for control, but the basis for litigation or discussion, in which the goal of preventing air pollution is often obscured. Previous standards are no longer applicable. New fuel, operating, and emission criteria must be established.

LEGAL AND ADMINISTRATIVE

1976

62335 **APTIC NO. 81869**

Cirillo, R. R., T. F. Tschanz, and A. E. Smith

AIR QUALITY ANALYSIS WORKSHOP. VOLUME II - EXECUTIVE SUMMARY (FINAL REPORT). *Argonne National Lab., Argonne, Ill., Energy and Environmental Systems Div., Office of Air and Waste Management Interagency Agreement, EPA-IAG-D6-0902, Proj. F 52047, Program Element 2AC-129, Rept. EPA-450/3-75-080-b, 37p., Feb. 1976. 16 refs.*

NTIS: PB 251684/AS

Summaries of eight Air Quality Analysis Workshops designed to provide assistance to working level air pollution control engineers and regional, state, and local planners in the use of Environmental Protection Agency guidelines for air quality analysis are presented. Technical problem areas covered include: air quality data, meteorology, emission inventory update, emission projections, subcounty allocations, air quality modeling and the analysis of model results, and strategy development and selection. Major emphasis is placed on analytical and technical procedures rather than on policy.

62336 **APTIC NO. 83054**

Clark, Bruce R.

CHEMICAL-BIOLOGICAL-ENVIRONMENTAL CHARACTERIZATION OF FOSSIL FUEL MATERIALS. *Preprint, National Bureau of Standards, Washington, D. C., 7p., 1976. 2 refs. (Presented at the National Bureau of Standards Workshop on Standard Reference Materials for Coal Gasification and Liquefaction, Gaithersburg, Md., Jan. 20-21, 1976.)*

The Oak Ridge National Laboratory s research program for evaluating the potential health and environmental effects of fossil fuel conversion materials is described. These materials include both products and process effluents. Most of the work at the present time involves initial chemical characterization and screening. Whole samples and fractions are provided for toxicity and mutagenicity studies to screen for biological activity. Screening tests are followed by the identification and characterization of active compounds in biota as well as in the abiotic environment. Chemical characterization is performed with the aid of flame photometric detectors for the detection of sulfur containing compounds and alkali flame ionization detectors for the detection of nitrogen containing compounds. A need for organic standard reference materials exists, especially with regard to benzo(3-4)pyrene analyses.

62337 **APTIC NO. 81867**

Crenshaw, J. D., C. H. Kuo, and J. D. Potter

STATE IMPLEMENTATION PLAN EMISSION REGULATIONS FOR SULFUR OXIDES: FUEL COMBUSTION (FINAL REPORT). *Office of Air and Waste Management, Research Triangle Park, N. C., Strategies and Air Standards Div., Rept. EPA-450/2-76-002, 81p., March 1976.*

NTIS: PB 251174/AS

One page summaries of each state s Implementation Plan regulations for sulfur oxide emissions from fuel combustion equipment (steam electric generating plants and industrial boilers which burn fuel to generate power) are presented. The relationship between the SIP regulations, the National Ambient Air Quality Standards, and the Federal Standards of Performance for New Stationary Sources is also discussed. Brief analyses of the various types of emission regulations which appear in the SIP s are presented.

62338 **APTIC NO. 84253**

Hansmann, Klaus

THE IMPORTANCE OF THE TECHNICAL INSPECTION ASSOCIATIONS AS EXPERTS IN THE FIELD OF OCCUPATIONAL HYGIENE, PROTECTION AGAINST IMMISSIONS AND TECHNICAL HAZARDS. *(Die Stellung der Technischen Ueberwachungs-Vereine als Sachverstaendige auf dem Gebiet des Arbeits-, Immissions- und technischen Gefahrenschutz). Text in German. TUE (Tech. Ueberwach.), 17(1):9-13, 1976. 70 refs.*

The range of duties of technical inspection organizations in the field of protection from occupational, ecological and technical hazards was discussed. Checks were to be performed by experts in the technical inspection associations. Submission of expert information in the event of administrative or legal procedures and expert services for individuals or agencies were often demanded. Technical experts developed for individuals or agencies were often demanded. Technical experts developed technical rules (DIN standards, VDI guidelines). Activity of the technical inspection organizations or of their experts was based on a legal agreement between client and association. Experts submitting their reports were under an obligation to be ojective and impartial. No conflict of interest ought to occur. The occupational safety law permitted the employer to comply with his legal duties by hiring plant physicians and an expert staff for industrial safety. These services could also be provided by the technical inspection organizations.

62339 **APTIC NO. 83672**

Heyden, Ludger van

THE TECHNICAL DIRECTIVE FOR THE CONSERVATION OF CLEAN AIR (TA LUFT) AND ITS IMPORTANCE TO THE PUBLIC GAS SUPPLY. *(Die Technische Anleitung zur Reinhaltung der Luft (TA Luft) in ihrer Beduetung fuer die oeffentliche Gasversorgung). Text in German. Gas Wasserfach-Gas/Erdgas (Munich), 117(2):84-88, 1976. 9 refs.*

The new technical directive for the conservation of clean air (TA Luft) promulgated in West Germany, and its implications for gas-fired installations and for public gas supply are discussed. The technical directive applies to gas-firing installations with a minimal capacity of 480 Gcal/hr. Relative to a flue gas with 3% oxygen, the sulfur dioxide concentration is limited to 50 mg/cu m for equipment burning natural gas, and to 100 mg/cu m for equipment burning coke-oven gas. The carbon monoxide and formaldehyde concentrations in the flue gas are limited to 100 mg/cu m and 20 mg/cu m, respectively. While there is no specific limitation on the nitrogen oxides emissions, the stack height must be determined as a function of this concentration. The greatest possible degree of nitrogen oxides emission abatement, e.g., by flue gas recirculation or two-stage combustion, is required. The SO2 and aldehyde emission standards can be complied with.

62340 **APTIC NO. 83776**

Iverach, D., T. R. Mongan, N. J. Nielsen, and J. R. Formby

VEHICLE RELATED AIR POLLUTION IN SYDNEY. *J. Air Pollution Control Assoc., 26(10):39-44, Jan. 1976. 12 refs.*

The techniques developed to estimate the impact of alternative transportation systems on the air quality of the Sydney, Australia Region are discussed. These techniques are centered around the development of a vehicle emissions inventory and a simplified diffusion model of the type proposed by Hanna. The use of these techniques is demonstrated by applying them, in conjunction with emission data on stationary sources, to estimate present pollutant concentrations in Sydney. Both motor vehicles and industry are important emitters of nonmethane hydrocarbons annd oxides of nitrogen, the precursors to the formation of oxidants. The enforcement of standards requiring emission reductions similar to the 1973 United States motor vehicle standards help alleviate Sydney s oxidant problem. More stringent standards are required to reduce ambient oxidation concentrations to the World Health Organization s long term goal of 0.06 ppm. (Author abstract modified)

62341 **APTIC NO. 84645**

Iwamoto, T.

RESULTS OF SURVEY ON THE CASES OF ACUTE MASS INJURY DUE TO AIR POLLUTION IN THE FIRST SIX YEAR HISTORY. *(Taikiosen niyoru kyusei shudan higai no shoki 6 nen-shi no jirei chosa). Text in Japanese. Preprint, General Research Society for Environmental Science, Japan, p. 136-137, 1976. (Presented at the Environmental Science Meeting, 2nd, Tokyo, Japan, June 4, 1976.)*

The first case of acute mass injury due to air pollution occurred on June 11, 1964 in 4 middle schools in Kawagoe City with 380 patients complaining of dyspnea, pain in the chest, and gasping. Since then, there were 4 cases until July 18, 1970 when the famous photochemical smog case occurred in the schools in the Suginami Ward. Since the number of 4 wheeled motor vehicles in Japan was 4.2 million in 1964, only one seventh of that of present, photochemical smog was not attributable to motor vehicles in the early cases. The locality of the first occurrence was a small rural town without any relationship to motor vehicles in the open fields of Saitama Prefecture, quite different from the basin of Los Angeles. The last case in Kisarazu with 6149 patients occurred with the sea wind changing from NW-W to SW along the east coast of Tokyo Bay extending to the Edogawa and Katsushika Wards of Tokyo Metropolis. The symptoms such as gasping, pain in the chest, dyspnea, numbness, and spasm were quite the same as those in the case of Suginami and those in all the photochemical smog cases in the recent 6 years. These facts indicate that the cause of photochemical smog are not from the reaction of nitrogen oxides and hydrocarbon catalyzed by the photoenergy of the sun.

62342 **APTIC NO. 83671**

Lauer, Karl-Heinz

FRENCH REGULATIONS CONCERNING THE CONSERVATION OF CLEAN AIR. *(Franzoesische Verordnungen zur Luftreinhaltung). Text in German. Gas Wasserfach-Gas/Erdgas (Munich), 117(2):89-90, 1976.*

Regulations promulgated in France on July 31, 1975, concerning air pollutant emissions and stack heights for firing equipment with capacities over 75 Mcal/hr are described. The necessary stack height is calculated as a function of unit capacity, sulfur dioxide background concentration, fuel sulfur content, and of the height and distance of obstacles. The maximal increase in the SO2 concentration that can be caused by the firing equipment is limited to 0.25 mg/cu m in areas with low pollution level, to 0.15 mg/cu m in moderately urbanized and industrialized areas, and to 0.10 mg/cu m in highly industrialized and urbanized areas. Minimal vertical flue gas speeds are specified as a function of the fuel sulfur content and of the type of the operation (continuous, low-load, or intermittent). The soot number will be limited to 4 as of 1980 in special protection zones.

62343 **APTIC NO. 83981**

Lebzeltern, H.

THE ENGINEER IN ENVIRONMENTAL PROTECTION. *(Der Ingenieur im Umweltschutz). Text in German. Oesterr. Ing.-Z., 19(2):45-48, 1976. 2 refs.*

The important role of the engineer in the field of environmental protection is described. Technical development over the last decades has led to increasingly larger industrial plants. People living in the vicinity need to defend themselves against their effects. They also expect help from the authorities in creating ecological legislation. It devolves on the engineers building plants to design them in such ways that impermissible pollution can be safely prevented. The difficult question as to where the limits of tolerance are resolved by pertinent regulations. Ordinances on environmental protection introduced in Austria, West Germany, and Italy are quoted concerning waste water, smoke, gas, heat, odor, and vibration. The protection of residential areas was stressed in the Vienna garage decree affecting schools, churches, hospitals, nurseries or other institutions. As a result of the complexity of the problems encountered, the cooperation of mechanical, automotive, construction, heating, ventilation, and chemical engineers, and meteorologists, physicians, and hygienists is necessary.

62344 **APTIC NO. 83072**

McGlennon, John A. S.

VERMONT. APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS; PROPOSED CHANGE IN THE REGULATION FOR COMBUSTION CONTAMINANTS AND PARTICULATE MATTER FROM INCINERATORS IN THE STATE OF VERMONT. *Federal Register, 41(10):2263, Jan. 15, 1976.*

A revision to the Vermont State Environmental Protection Regulations was submitted to be included in the Vermont Implementation Plan. The change in the incinerator regulation specifies that substantial operating data to show compliance with emission standards is required in order to build or install incinerators with a capacity of less than 500 lbs/hr of refuse, unless the incinerator is to be used exclusively for the destruction of pathological waste.

62345 **APTIC NO. 84245**

Sander, H. P.

LEGAL QUESTIONS CONCERNINNG THE COMBUSTION OF WOOD RESIDUES. *(Rechtsfragen bei der Verbrennung von Holzresten). Text in German. Wasser Luft Betrieb, 20(1):30, 1976.*

Problems of the legality of wood residue burning in different states of the German Federal Republic are discussed. In 1968, a Bavarian court of justice ruled that an occasional burning of wood waste in a commercial installation (furnace) for hot water preparation and heating was not forbidden, but was subject to environmental protection ordinances. In Northrhine-Westphalia, it was prohibited for central heating and domestic heating to use trash or similar waste. Woodcuttings, incidental to woodworking and processing, could be utilized for heating. The federal ruling that waste material could only be processed in appropriate waste-removal plants found exceptions, in part temporary, in Baden-Wuerttemberg, Hamburg, Lower Saxony, Rhineland-Palatinate, Saarland, and Schleswig-Holstein with regard to waste of vegetable origin. In installations in which woodcuttings or wood powder were used, a limit of 300 mg/cu m, related to the standard smoke gas, and a limit on CO2 volume of 12%, were set. Wood residues, according to the regulation, did not represent waste material provided that they were burned with the objective of obtaining usable heat.

62346 **APTIC NO. 84487**

Southerland, James H.

EPA S AEROMETRIC AND EMISSIONS REPORTING SYSTEM. *Environ. Data Serv., 1976:16-20, March 1976.*

The Environmental Protection Agency s Aerometric and Emissions Reporting System is described. The system is a comprehensive computer-based operation established by the National Air Data Branch to collect, store, and analyze air pollution data. The system includes both the National Emissions Data System and the Storage and Retrieval of Aerometric Data system as well as numerous other subsystems. Data for the system are collected by various state and local agencies and reported to EPA. These data are then stored and analyzed in AEROS. The most notable feature of AEROS is that it is a reporting system. The primary function of AEROS is to provide concise and standardized reports on various aspects of air pollution.

62347 **APTIC NO. 83436**

Stevenson, Walter H.

STATUS AND DIRECTION OF NOX CONTROL. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Control Programs Development Div., 13p., 1976. (Presented at the NOx Control Technology Seminar, San Francisco, Calif., Feb. 5, 1976.)*

The present status and future need for nitrogen oxide control is reviewed in relation to existing regulation and Environmental Protection Agency control programs. The unavailability of valid air quality data has resulted in a lack of active NOx control measures in most State Implementation Plans. However, current nitrogen dioxide air quality data indicate that most areas are capable of attaining the NO2 air quality standard. The growth of mobile and stationary sources is expected to present a problem for maintaining NO2 air quality levels, and additional control of existing NOx stationary sources may be required in some areas. The principal direction of NOx control is nevertheless expected to be toward new sources of NOx. New source review procedures and general air quality maintenance planning are going to be the principal elements of NOx control. An important factor that will influence future NOx control is the Clean Air Act Amendments to be completed by mid-1976. It is important that communities tie their new source review programs into air quality maintenance plans and overall land use plans for future NOx control efforts. (Author summary modified)

62348 **APTIC NO. 82480**

Strelow, Roger

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND ENGINES. EXTENSION OF COMMENT PERIOD ON PROPOSED EMISSION REGULATIONS FOR NEW MOTORCYCLES. *Federal Register, 41(10):2264, Jan. 15, 1976.*

An extension of the comment period on proposed emission regulations for new motorcycles is announced. A 90 day public comment period to end Jan. 20, 1976 was initially established. The Motorcycle Industry Council requested an extension of the comment period by 10 days to allow a number of motorcycle manufacturers to complete certain analyses needed to provide more substantive comment on the proposed regulations. The period for submitting written data and views bearing on the proposed regulation is extended to Jan. 30, 1976.

62349 **APTIC NO. 81090**

Van Hook, R. I. and E. E. Huber

NATIONAL ENVIRONMENTAL SPECIMEN BANK SURVEY (FINAL REPORT). *Oak Ridge National Lab., Oak Ridge, Tenn., Environmental Sciences Div., Environmental Protection Agency Interagency Agreement IAG-D4-0509, Program Element IAA005, Rept. EPA-600/1-76-006, 214p., Jan. 1976. 657 refs.*

The data base developed in the National Environmental Specimen Bank Survey is presented. The 657 extant specimen and data collections documented in the data base include the following categories: air pollution (gases, particulates, pesticides); biological research (plant, animal, and human); water pollution; geology; and microbiology. The data base includes three indices: names and addresses of respondents categorized by organizational affiliation, an alphabetical listing of respondents, and the geographical sampling location for materials in collections. The NESB Survey Data Base is unique in that it provides potential access through indices to these collections for obtaining chemical, physical, and taxomomic information on their contents. (Author abstract modified)

62350 **APTIC NO. 81866**

Office of Air and Waste Management, Research Triangle Park, N. C., National Air Data Branch

AEROS MANUAL SERIES. VOLUME I: AEROS OVERVIEW. *Rept. EPA-450/2-76-001, OAQPS 1.2-038, 92p., Feb. 1976.*

NTIS: PB 251234/AS

An overview of the Aerometric and Emissions Reporting System (AEROS) is presented. Topics covered include: the history of AEROS, the AEROS management structure, and the system philosophy of AEROS. The system was established by the Environmental Protection Agency to serve as a management information system for EPA s air pollution research and control programs and is mainly concerned with the collection, processing, and reporting of basic air pollution and emissions data. The input forms, procedures, computer programs, data files, and reports of AEROS are under the management of the National Air Data Branch. The 10 EPA Regional Offices are responsible for the receipt, preliminary data processing, error correction, and submittal of data to the NADB. Regional Offices also support AEROS users in their region.

62351 **APTIC NO. 81868**

Office of Air and Waste Management, Research Triangle Park, N. C., Monitoring and Data Analysis Div.

GUIDELINES FOR EVALUATING SUPPLEMENTARY CONTROL SYSTEMS (FINAL REPORT). *Program Element 2 AC 129, Rept. EPA-450/2-76-003, OAQPS 1.2.-036, 76p., Feb. 1976. 11 refs.*

NTIS: PB 251558/AS

Guidelines for evaluating supplementary control systems for sulfur dioxide emissions, i.e., control by the temporary curtailment of emissions when meteorological conditions conducive to high ambient SO2 concentrations exist or are anticipated, are presented. The guidelines include: the basic functions and elements of supplementary control systems; applications for use of supplementary control systems; background evaluation studies involving air quality and emission monitoring meteorological forecasting, and data analysis; and an assessment of supplementary control system enforcement problems. The guidelines are intended for use by the control agency and by the user of a supplementary control system.

62352 **APTIC NO. 82652**

Stichting CONCAWE, The Hague (Netherlands)

PUBLISHED REGULATORY GUIDELINES OF ENVIRONMENTAL CONCERN TO THE OIL INDUSTRY IN WEASTEN EUROPE. *Rept. 1/76, 37p., Jan. 1976. 54 refs.*

A compilation of environmental regulations relating to the oil industry in Western Europe is presented. Both official regulations and generally adopted, although unofficial guidelines, are presented. Tables containing information of regulations relating to fuel oil sulfur content, gasoline composition, and gasoline engine vehicle emissions are presented.

62353 **APTIC NO. 83870**

TREND OF ENVIRONMENTAL ADMINISTRATION IN THE NOX REGULATION STRENGTHENING. *(NOx kisei kyoka ni miru kankyo gyosei no hoko). Text in Japanese. Kagaku Kojo (Chem. Factory), 20(2):14-25, Feb. 1976. 27 refs.*

The trend of environmental administration is given in relation to the stricter nitrogen oxide regulations in the second phase agreed upon by the Air Quality Bureau of the Environmental Agency and the Industrial Location and the Environmental Protection Bureau of the Ministry of the International Trade and Industry. The basic version of the strict NOx environmental standard states that the NOx from stationary and mobile sources will be regulated as strictly as possible by 1976, and that there will be a third phase regulation for NOx from stationary sources by the end of 1976. For passenger cars, the 1978 NOx environmental standard will be determined in autumn of 1976 and the stricter NOx regulation for trucks and diesel cars must be observed starting at the end of summer of 1976. The noteworthy part of this NOx regulation is the right of choice given to select one of the methods for reduction of NOx, for example, improvement of the combustion method, stack gas denitration method or fuel change, and a statement of the estimated cost necessary for introduction of these methods to reduce emission of NOx.

62354 **APTIC NO. 84415**

STATUS REPORT. *National Research Council Canada, Ottawa, Associate Committee on Scientific Criteria for Environmental Quality, 90p., Jan. 1976.*

The status report of the Associate Committee on Scientific Criteria for Environmental Quality is presented. The following priorities are identified for study by the Subcommittee on Air: mixed system involving sulfur dioxide such as SO2 in presence of particulates associated with power plants, SO2 with hydrogen fluoride associated with fertilizer plants, and other special situations; automobile exhaust including hydrocarbons, carbon monoxide, lead, and benzopyrene; and miscellaneous systems not found in the other classes.

1975

62355 **APTIC NO. 76424**

Ando, T.

BACKGROUND AND PRESENT SITUATION OF HYDROCARBON CONTROL IN YOKOHAMA CITY. *(Yokohama-shi ni okeru HC rui kisei no haikei to genjo). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 27(10):17-23, 1975.*

As a part of photochemical smog and malodor control measures, a guidance manual for controlling vaporization and dispersion of hydrocarbons was prepared for Yokohama city.

The necessity for control regulation of HC is discussed with a description of the formation mechanism of photochemical smog, the status of photochemical smog in Yokohama, and trends in control regulations. The classification of emission sources, data of total emission quantity and contribution rate and reduction target set by the guidance manual are given. A description of the Yokohama guidance manual is given with a summary of HC emission control regulations of other municipalities.

62356 **APTIC NO. 75970**

Armentrout, David W. and Charles E. Zimmer

STATUS OF NADB DATA SYSTEMS (FINAL REPORT). *PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Office of Air and Waste Management Contract 68-02-1375, Task 10, Rept. EPA-450/3-75-065, 209p., April 1975.*

NTIS: PB 245009/AS

The results of a survey conducted among Environmental Protection Agency users of the National Air Data Branch systems to determine how current systems or planned changes meet the users requirements are presented. Major problem areas for both the National Emissions Data System and the Storage and Retrieval of Aeromatic Data system in terms of data base operations are currency of the data, data quality, and responsiveness of the system for report retrieval. Problem areas related to data analysis include: data base discontinuity, definition of user requirements, and quality control in data collection. No specific recommendations that can be translated into implementation specifications are reported for other NADB systems.

62357 **APTIC NO. 82877**

Askew, Marshall

MODERN BRITISH TECHNOLOGY FOR THEPROECTION OF ENVIRONMENT. *(Moderna tecnologia britanica para proteccion del medio ambiente). Text in Spanish. Afinidad, 32(329):765-766, Sept. 1975.*

In Great Britain various methods for biological waste water purification and technological industrial smog control have been discussed with respect to legislative developments since the turn of the century. Regional hydrographic organizations have been established for the administration of local waters and public water works. As for smog control, different types of fuels, filters and collectors have been suggested. Several British companies are now developing new types of analytical gas samplers and automatic control devices.

62358 **APTIC NO. 76055**

Axtell, Kenneth, Timothy W. Devitt, and Norman J. Kulujian

INSPECTION MANUAL FOR THE ENFORCEMENT OF NEW SOURCE PERFORMANCE STANDARDS. MUNICIPAL INCINERATORS (FINAL REPORT). *PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-1073, Rept. EPA-340/1-75-003, 98p., Feb. 1975. 29 refs.*

NTIS: PB 245848/AS

Guidelines for the enforcement of New Source Performance Standards for municipal incinerators are presented. The guidelines provide a summary of the NSPS, a description of the process and emissions generated by it, applicable control methods, monitoring instrumentation, performance tests, and procedures for periodic inspection. Suggestions for the writing of reports and keeping of records are also provided. The major emission point from municipal incinerators and the only one subject to the NSPS is the furnace stack. The only pollutant discharge subject to the NSPS is particulate matter. Emission rates are closely related to incinerator design, method of operation, and composition of the refuse charged.

62359 **APTIC NO. 83645**

Bargetzi, S.

MEASURES OF ENVIRONMENTAL PROTECTION IN THE ENERGY SECTOR. *(Umweltschutzmassnahmen im Bereich der Energie). Text in German. Schriftenr. Schweizer. Ver. Gesundheitstech., vol. 41:9-13, 1975.*

The extent of environmental pollution and planned countermeasures are discussed. Production and use of thermal energy results in pollution of the atmosphere, water, and soil, changes landscape structure, causes noise, and influences the climate. Domestic and industrial combustion were the chief sources of air pollution in the industrialized world producing sulfur dioxide, ashes, nitrogen oxide, soot and incompletely burnt oil ingredients. Intermediate measures involve technology and planning, require studies and legislation and their effect would only appear gradually. Long-term measures are technological in nature and necessitate planning. They are often expensive and aim at lowering air pollution at the source, improving air quality, and maintaining natural climatic conditions. Emission control of domestic and industrial combustion can be prevented by using heating oil low in SO2 and furnaces with low emission and little maintenance. Effective dust separation and waste gas purification could also contribute to reduced emission. In the field of planning and organization, centralization of single heating units into a collective one, remote heating systems and utilization of usable waste heat are being considered. Construction and operational measures for more economical and effective use of thermal energy involve better heat insulation, building elements, room temperature, and ventilation coefficient.

62360 **APTIC NO. 83713**

Baum, Fritz

CONTROL MEASUREMENTS OF FIRING SYSTEMS IN HOUSEHOLDS AND SMALL COMMERCIAL ENTERPRISES. *(Kontrollmessungen en Feuerungsanlagen in Haushalt und Kleingewerbe). Text in German. Sanit. Heizungstech., 40(8):469-473, Aug. 1975. 25 refs.*

The German federal law of September 1974 on emission allowances of furnaces using liquid fuels distinguishes between those with small vaporizing burners and those with large vaporizing burners or atomizing burners having nominal heat capacity of 9554 kcal/hr. Small furnaces using low-fume solid fuels and slow burning stoves are permitted a capacity of 19,108 kcal/hr. Measurement techniques for liquid-fuel furnaces are described along with a filter paper method to determine soot. The regulation recommends the measurement of CO2 volume, smoke temperature and pressure differences in the nuclear portion of an exhaust blast to determine the operative status of firings. To test for oil derivative emissions the pyridine test based on paper chromatography was used.

62361 **APTIC NO. 84452**

Benson, Glenn E. and Terry M. Seiders

AIR QUALITY IMPACT ANALYSES IN AN ENVIRONMENTAL IMPACT ASSESSMENT. *Preprint, Purdue Univ., West Lafayette, Ind., 13p., 1975. (Presented at the Purdue Air Quality Conference, Annual, 14th, Indianapolis, Ind., Nov. 12-13, 1975.)*

Air quality impact considerations involved in environmental impact assessments are reviewed. A comprehensive air quality impact assessment must achieve the following: demonstrate that the emissions from the ffacility are in compliance with all applicable Federal and state emission control regulations; demonstrate what impact the emissions exert in relation to the ambient air quality standards and significant deterioration standards; and adequately address all other air quality aspects such as odor control, fugitive emissions control, and aesthetic air quality considerations.

62362 **APTIC NO. 83642**

Boehlen, B.

ENERGY PROBLEMS FROM THE VIEWPOINT OF ENVIRONMENTAL PROTECTION. *(Energieprobleme aus de Sicht des Umweltschutzes). Text in German. Schriftenr. Schweizer. Ver. Gesundheitstech., vol. 41:5-8, 1975.*

The mutual relationship between energy and environment is discussed. The rapid demographic and economic development of urban and industrial agglomerates, combustion processes to provide heat, the mobility of modern society, the consumer economy, inadequately purified sewage, and polluted bodies of water produced or were the targets of pollution. Therefore the objectives of environmental protection are to prevent, ecological damage. In this context, it is indispensable to balance the conflicting goals of energy and environment. It is necessary to establish the demands of environmental quality and to make them the basis for the developmental perspective in the field of energy. A differentiation must be made nrtween world-wide pollution to be controlled by international strategy and national/regional pollution. In Switzerland, air and water pollution is attributable to domestic furnace waste gases, industry, conventional and nuclear power stations, and crude oil products which also contaminate the soil. A more economic use of energy must be made an objective of ecological protection and energy policy. Alternate energy sources will be tested for compatibility with this goal.

62363 **APTIC NO. 83931**

Boerker, E.

RULES AND REGULATIONS ON CLEAN AIR MAINTENANCE. *(Vorschriften und Richtlinien zur Reinhaltung der Luft). Text in German. PTB- Mitt., 85(5):378-379, Oct. 1975.*

The German Federal Ministry of the Interior has passed another administrative measure to regulate emissions control systems for air pollutants and meteorological factors. This will be the basis for controlling affected areas, which is important to the implementation of BImSchG (the Federal Emissions Control Law). Guidelines have been formulated for suitable testing of current pollution control systems. These include dust counters, flue gas densitometers and sulfur dioxide detectors, which will also be subjected to tests for minimum standards and proper functioning.

62364 **APTIC NO. 75190**

Brail, R. K., D. R. Mandelker, T. A. Sherry, and G. Hagevik

EMISSION DENSITY AND ALLOCATION PROCEDURES FOR MAINTAINING AIR QUALITY. *Rutgers Univ., New Brunswick, N. J., Center for Urban Policy Research, Office of Air and Waste Management Contract 68-02-0278, Rept. EPA-450/3-75-079, 100p., June 1975. 59 refs.*

NTIS: PB 248773/AS

Emission density and allocation procedures for maintaining air quality are reviewed. Regulations dealing with emission allocations, floating zone emission quotas, district emission quotas, and emission density zoning are discussed, and specific experiences with floating zone emission quotas in Jefferson County, Kentucky and with emission density zoning in Cook County, Illinois are described. Legal issues relating to equal protection and due process are examined along with methodological concerns dealing with the integration of land use planning and air pollution control. (Author abstract modified)

62365 **APTIC NO. 76139**

Bryan, R. J., P. C. Kochis, J. W. Boyd, M. L. McQueary, and R. L. Norton

GUIDELINES FOR ENFORCEMENT AND SURVEILLANCE OF SUPPLEMENTARY CONTROL SYSTEMS (FINAL REPORT). *Pacific Environmental Services, Inc., Santa Monica, Calif., Environmental Protection Agency Contract 68-02-1390, Rept. EPA 340/1-75-008, 155p., Sept. 1975. 35 refs.*

NTIS: PB 247789/AS

Guidelines for assisting Federal, state, and local air pollution control agencies in conducting the surveillance and enforcement of supplementary control systems for sulfur dioxide emissions are presented in two volumes. Supplementary control systems are systems by which stack emissions of SO2 are curtailed during periods when meteorological conditions conducive to ground level concentrations in excess of the National Ambient Air Quality Standards exist or are anticipated. The first volume includes: a description of SCS elements as well as SCS violations, types of inspections and review procedures used for surveillance and enforcement, and inspection and calibration procedures for ambient and emission monitors and meteorological instruments. The second volume contains detailed background information on inspection and calibration procedures for SO2 ambient and emission monitors and meteorological instruments. (Author abstract modified)

62366 **APTIC NO. 79899**

Bryant, David A., Alan H. Castaline, and Theodore P. Midurski

IDENTIFICATION AND EVALUATION OF LOCALIZED VIOLATIONS OF CARBON MONOXIDE STANDARDS. VOLUME II: DEVELOPMENT OF GUIDELINES (DRAFT FINAL REPORT). *GCA Corp., Bedford, Mass., GCA/Technology Div., Environmental Protection Agency Contract 68-02-1337 and 68-02-1376, Task Order 6, Rept. GCA-TR-75-36-G(2), 156p., Nov. 1975. 14 refs.*

The development of a series of guidelines for the identification and evaluation of localized violations of carbon monoxide air quality standards is described. Guidelines for primary screening were based upon the Environmental Protection Agency Indirect Source Guidelines and generalized traffic data. Verification guidelines specify the use of available air quality models and provide a calculated CO level. Verification screening is sufficiently detailed that in some cases it may be adequate as a tool for evaluation of alternative control measures. A brief outline is provided of the development of guidelines for modeling hot spots and planning improvements. The guidelines were tested at 51 locations in Waltham, Massachusetts. Thirty were shown to be potential hot spots after two stages of screening. (Author abstract modified)

62367 **APTIC NO. 82776**

Burckle, John O.

CAPABILITIES OF COMMERCIALLY AVAILABLE GAS CLEANING DEVICES FOR FINE PARTICULATE EMISSIONS CONTROL - A RESEARCH PROGRAM. *Preprint, Environmental Protection Agency, Cincinnati, Ohio, Office of Research and Development, 6p., 1975. (Presented at the Energy and the Environment National Conference, 3rd, Oxford, Ohio, Sept. 29-Oct. 1, 1975.)*

An Environmental Protection Agency research program designed to evaluate the capabilities of commercially available fabric filters and wet scrubbers for fine particulate control is described. The program comprises two major projects. The first of these is to test selected devices under several standardized conditions in a pilot-scale test facility constructed specifically for this purpose. The second project deals with the testing of actual field installations to obtain a basis for comparing field results with those from the test facility. The test facility includes three types of aerosol sources and two independent test loops, one for fabric filters and one for wet scrubbers or fabric filters. The test aerosols are obtained from a slipstream of a coal-fired power plant, a metallurgical fume generator, and a hammermill/classifier.

62368 **APTIC NO. 83760**

Busi, Roberto

URBAN PLANNING AND AIR POLLUTION. (La pianificazione urbanistica e l inquinamento atmosferico). Text in Italian. Inquinamento, 17(10):28-36, 39, Oct. 1975. 55 refs.

Air pollution has produced marked climatic changes in urban environments. Rural/urban ratios are 1:5 for sulfuric acid and 1:10 for aerosols and dust; average annual temperature has changed, and relative humidity is 6% less in cities than in rural areas. Total precipitation is 5-10% greater, as is cloudiness; winter clouds are 100% greater, average annual velocity of air currents 20-30% lower, and periods of calm 5-20% greater in cities. These phenomena are further illustrated by Milan statistics. Urban zoning can be a means of controlling gaseous effluent emissions and should be complemented with emission control. Vehicle pollution can be reduced by electrical vehicles and additional public transport. Greenery, which is disappearing in cities, is also a significant means of improving the quality of the air, by absorbing carbon dioxide and producing oxygen, and by capturing dust particles. An efficiently planned greenery system can also correct climatic unbalances. Plants resistent to pollutants, especially to sulfur dioxide, include maples, dogwood, and oak.

62369 **APTIC NO. 73559**

Cederna, Antonio, Fabrizio Giovenale, Luigi Piccinato, and Edoardo Salzano

CITY PLANNING. *(Il piano regolatore). Text in Italian. Doc. Ital. Nostra, vol. 12:51-73, 1975 (?).*

The need for a regulatory operating plan for the continued and controlled urban development of Rome is discussed. Any such plan must have a well-defined direction, both politically and administratively. Inhabitants of Rome s districts should be made aware of urban development laws and encouraged to contribute their own ideas to city growth, especially at the neighborhood level. The public should be made aware of more than just penalties for city development violations.

62370 **APTIC NO. 82761**

Clements, John B., M. Rodney Midgett, and John H. Margeson

EVALUATION OF AIR POLLUTION MEASUREMENT METHODOLOGY. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Quality Assurance Branch, 10p., 1975. 9 refs.*

The Environmental Protection Agency s program for evaluating air pollution measurement methodology is outlined. The program is particularly directed toward evaluating reference methods used to determine compliance with regulatory standards and involves both ambient air and stationary source emission measurement methods. A two-step process is used for evaluations. The first step is an in-depth investigation of the particular measurement method in a single laboratory where critical features such as collection efficiency, reagent requirements, critical operational steps, calibration requirements, and clarity of direction are examined in detail. The second step involves an interlaboratory collaborative test during which the method is used by typical air pollution laboratories to measure the concentration of reference materials. Statistics such as within- and between-laboratory precision and method bias are determined by the collaborative testing. Examples of the evaluation process are presented for sulfur dioxide and hydrocarbon reference methods. (Author abstract modified)

62371 **APTIC NO. 84419**

Cramer, R. S.

AUTOMOTIVE EMISSION REGULATIONS AND THEIR IMPACT ON REFINERY OPERATIONS. *IPIECA, Petrol. Environ. Conserv. Symp. Rep., Tehran, Iran, 1975, p. 95-153. 14 refs. (April 7-9, Paper 3.)*

Automotive emission regulations and their impact on refinery operations are discussed. Although there is no evidence that airborne lead from motor vehicle exhaust is harmful to health, restriction of the use of lead alkyls in motor gasoline is legislated. Reduction of Pb limits below 0.4 g Pb/l results in requirements for new process plants in refineries with consequent investment costs and increased energy use/unit of gasoline produced. At 0.4 g Pb/l some refiners do not require new plants, but operating costs and energy usage are increased and production potential reduced. Any limitation of other gasoline constituents such as benzene or total aromatics adds to the difficulties, cost, and energy requirements. The problems are more severe and costly to solve for the simple hydroskimming refinery than for the more complex refineries. (Author conclusions modified)

62372 **APTIC NO. 83965**

Csinady, Laszlo

RELATIONSHIPS BETWEEN ENVIRONMENTAL PROTECTION AND PUBLIC HYGIENE IN KOMAROM COUNTY (HUNGARY). *(A kornyezetvedelem es kozegeszsegugy osszefuggesei Komarom megyeben). Text in Hungarian. Budapesti Kozegeszsegugy, no. 1:16-19, 1975. 11 refs.*

General environmental and hygienic problems of Komarom county, Hungary, are reviewed. This county has the highest population density and highest level of urbanization and industrialization in the entire country. Accordingly, the air pollution levels measured in this county are among the highest countrywide. In Tatabanya, a highly industrialized town, the settling dust, total sulfur, and sulfur dioxide concentrations are substantially higher than the hygienic standards. The total sulfur and SO2 concentrations are further increased by domestic heating during the winter months. The fluorine concentrations measured in a 2000 m radius around an aluminum smelting plant exceed the maximum allowable concentrations. The measures taken so far (construction of high stacks, dust separation in industrial plants, neutralization of fluorine-containing waste gases, and liquidation of residential districts near polluting industrial plants) have not been sufficient for a substantial improvement of the environmental quality. The incidence of respiratory tract diseases is above the national average, which may be due to air pollution.

62373 **APTIC NO. 81982**

Czerniak, G., William Thorp, and P. Byron

THE ORGANIC EMISSION PROGRAM OF CHICAGO. *Preprint, City of Chicago, Ill., Dept. of Environmental Control, 47p., 1975. (Presented at the Environmental Aspects of Chemical Use in Printing Operations Conference, King of Prussia, Pa., Sept. 22-24, 1975.)*

Chicago s Environmental Control Ordinance includes an amendment regulating the storage and handling of organic material as well as emissions from stationary sources. This ordinance necessitated the Organic Emissions Survey. Organic emission survey forms were first sent to companies emitting 2000 gallon/yr or greater according to the 1973 and 1974 emission inventories. It was felt that a cooperative attitude would be more likely to give the required results in the shortest period of time. Interpretations of the unclear sections of the ordinance are given. Hydrocarbon data forms were first mailed to the major solvent emitters in order to distribute the work load associated with processing the data forms. The Hydrocarbon Data Form was modified and renamed the Organic Emission Data Form after the data submitted on the forms and the companies reactions were analyzed. Followup letters were sent to those companies not responding to the original mailing. The Organic Emission Data Forms were analyzed using two computer programs. The definition of photochemically reactive compounds is discussed. Because each situation varied, it was not practicable to use a computer method to analyze all sections of the Organic Emission Data Form. When a company might have been in violation of the Organic Emission Ordinance, the company was requested to attend an informal meeting to discuss the matter. A yearly updating will take place through an annual inspection program.

62374 **APTIC NO. 76221**

Davies, R. J. P.

URBAN PLANNING AND POLLUTION CONTROL. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975. p. 637-661. 13 refs. (Feb. 17-21.)*

The usefulness of urban land use controls in reducing air pollution and other forms of environmental deterioration is reviewed along with the interrelationships between various pieces of environmental protection legislation in New Zealand. Specific pieces of legislation discussed include: the Town and Country Planning Act of 1953, the Clean Air Act of 1972, the Water and Soil Conservation Act of 1967, the Health Act, the Municipal Corporations Act, the Counties Act, and the Agricultural Chemicals Act of 1959. Recommendations for integrating the goals of these pieces of legislation into a simple land, water, and air preservation, conservation, and development program are presented. The organization of such a program is seen as best being accomplished at a regional level in New Zealand.

62375 **APTIC NO. 79638**

De Falco, Paul, Jr.

ARIZONA: APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS; REGULATION TO CONTROL OPEN BURNING. *Federal Register, 40(181):42896, Sept. 17, 1975.*

The Arizona State Department of Health Services amended the state Rules and Regulations for Air Pollution Control by adding a regulation which provides for the control of open burning. The new regulation makes unlawful any burning in the open where the products of combustion are not directed through a flue. Exemptions are provided for cooking and recreational fires and fires for frost protection. Public agencies may obtain permission to conduct open burnings for appropriate purposes. The regulation was submitted as a formal revision to the State Implementation Plan.

62376 **APTIC NO. 79700**

De Falco, Paul, Jr.

NEVADA: APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. *Federal Register, 40(181):42896-42897, Sept. 17, 1975.*

States are required to adopt, submit, and implement legally enforceable regulations and administrative procedures for the review of indirect sources. Environmental Protection Agency approval is proposed for indirect source regulations adopted by Clark County, Nevada as part of the Nevada Implementation Plan for National Ambient Air Quality Standards. Large shopping centers, sports complexes, drive in theaters, recreational areas, parking lots of greater than 500 spaces, and highways and airports with sufficient predicted use will be reviewed.

62377 **APTIC NO. 80160**

De Falco, Paul, Jr.

CALIFORNIA; HUMBOLDT COUNTY AND DEL NORTE COUNTY AIR POLLUTION CONTROL DISTRICTS. DELEGATION OF AUTHORITY. *Federal Register, 40(177):42237-42238, Sept. 11, 1975.*

Authority to enforce new stationary source performance standards (NSPS) and national emission standards for hazardous air pollutants (NESHAPS) was delegated to California on behalf of Humboldt County and Del Norte County Air Pollution Control Districts. New sources covered include steam generators; incinerators; petroleum refineries; storage; secondary lead smelters; sewage treatment; and cement, nitric acid, sulfuric acid, asphalt concrete, secondary brass and bronze ingot, and iron and steel plants. The hazardous air pollutants are asbestos, beryllium, and mercury. The air pollution control districts may not grant variances allowing a source to violate Federal regulations. Methods of performing source tests and conditions for revoking authority are specified. Reports pertaining to NSPS and NESHAPS by sources located in the Humboldt or Del Norte County Air Pollution Control District should be submitted to the appropriate Air Pollution Control District. The addresses are included.

62378 **APTIC NO. 83813**

DeFalco, Paul

ARIZONA: COUNTY REGULATIONS FOR PROCESS SOURCE CONTROL AND NEW SOURCE REVIEW PROCEDURES. APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. *Federal Register, 40(163):36577-36578, Aug. 21, 1975.*

County regulations for process source control and new source review procedures in Arizona are announced. Pima County adopted amended regulations for the review of new and modified sources, and transmitted them to the state, which submitted them to the Environmental Protection Agency. If the proposed revisions are approvable, Pima County will assume responsibility for the review of new and modified sources within its jurisdiction.

62379 **APTIC NO. 79737**

DeFalco, Paul, Jr.

CALIFORNIA: MONTEREY BAY UNIFIED AIR POLLUTION CONTROL DISTRICT. DELEGATION OF AUTHORITY. *Federal Register, 40(177):42238-42240, Sept. 11, 1975.*

The delegation of authority to implement and enforce new stationary sources (NSPS) and national emission standards for three hazardous air pollutants (NESHAPS) in California is announced. The six categories of new sources covered by the delegation are fossil fuel fired steam generators; incinerators, portland cement plants; asphalt concrete plants, storage vessels for petroleum liquids; and sewage treatment plants. The three hazardous air pollutants covered by the delegation are asbestos, beryllium, and mercury.

62380 **APTIC NO. 80768**

DeFalco, Paul Jr.

CALIFORNIA; BAY AREA AIR POLLUTION CONTROL DISTRICT. DELEGATION OF AUTHORITY. *Federal Register, 40(177):42236-42237, Sept. 11, 1975.*

Authority must be delegated for the new source performance standards and national emission standards for hazardous air pollutants to states submitting adequate procedures. Authority was delegated to California on behalf of the Bay Area Air Pollution Control District, but California s Air Resources Board was unwilling to agree to the wording of two conditions. The Environmental Protection Agency determined that clarification of the conditions was appropriate. California s objections made the previous delegation ineffective, and a new letter delegating authority is included. Authority is delegated for new stationary sources in the Bay Area Pollution Control District. The hazardous air pollutants covered are asbestos, beryllium, and mercury. Semiannual reports will be submitted to the EPA by the District. The EPA has concurrent enforcement authority. California and the District did not request delegation of authority over federal facilities. The District may not grant variances from federal regulations. The district s tests methods must be acceptable to the EPA. Air Resources Board and EPA will develop a communications system to inform each office regarding the current compliance status of sources in the district and the interpretation of regulations. Where there is conflict, the federal regulation must be applied if it is more stringent. The EPA will revoke authority if enforcement or implementation is inadequate. The EPA received no objections to the letter included. Amendments to the letter are also included. Reports pursuant to the NSPS and NESHAPS by sources in the district should be submitted to the district rather than the EPA. The address is included.

62381 **APTIC NO. 76054**

Devitt, Timothy W. and Norman J. Kulujian

INSPECTION MANUAL FOR THE ENFORCEMENT OF NEW SOURCE PERFORMANCE STANDARDS. FOSSIL-FUEL-FIRED STEAM GENERATORS (FINAL REPORT). *PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-1073, Rept. EPA-340/1-75-002, 140p., Feb. 1975. 54 refs.*

NTIS: PB 246087/AS

Guidelines for the enforcement of New Source Performance Standards for fossil-fuel-fired steam generators are presented. The guidelines provide a summary of the NSPS, a description of the process and emissions generated by it, applicable control methods, monitoring instrumentation, performance tests, and procedures for periodic inspection. Suggestions for the writing of reports and keeping of records are also provided. The NSPS apply to particulate, sulfur dioxide, nitrogen oxide, and opacity levels generated by such processes. These standards are applicable to each fossil-fuel-fired steam generating unit of more than 63 million kcal/hr heat input which is constructed or modified after August 17, 1971.

62382 **APTIC NO. 76056**

Devitt, Timothy W. and Norman J. Kulujian

INSPECTION MANUAL FOR THE ENFORCEMENT OF NEW SOURCE PERFORMANCE STANDARDS. SEWAGE SLUDGE INCINERATORS (FINAL REPORT). *PEDCo- Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-1073, Rept. EPA-340/1-75-004, 92p., Feb. 1975. 26 refs.*

NTIS: PB 246112/AS

Guidelines for the enforcement of New Source Performance Standards for sewage sludge incinerators are presented. The guidelines provide a summary of the New Source Performance Standards, a description of the process and emissions generated by it, applicable control methods, monitoring instrumentation, performance tests, and procedures for periodic inspection. Suggestions for the writing of reports and keeping of records are also provided. Although odors are major air contaminants resulting from sewage sludge incinerator operation, odor emissions are not covered by the new source regulations. Well-operated sludge incinerators employing proper housekeeping procedures maintain odors at a tolerable level. Particulate emissions are almost entirely a function of scrubber efficiency and are only minimally affected by incinerator conditions.

62383 **APTIC NO. 83408**

Dimitriades, Basil

OXIDANT CONTROL STRATEGIES. PART I. AN URBAN OXIDANT CONTROL STRATEGY DERIVED FROM EXISTING SMOG CHAMBER DATA. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Environmental Research Center, 48p., Aug. 1975. 16 refs.*

A method for deriving an optimum control strategy for urban oxidant reduction using smog chamber data is described. Data from smog chamber studies of oxidant-precursor relationships are analyzed, and diagrams depicting the quantitative dependence of maximum 1-hour oxidant concentration on the nonmethane hydrocarbon and nitrogen oxide reactants are derived. The advantage of this smog chamber method over currently used aerometric data analysis methods is that it considers the role of NOx quantitatively. Thus, hydrogen control requirements calculated by this method depend on ambient NOx concentration and can be minimized by controlling NOx to an optimum maximum level. A comparison of the smog chamber data used in the present experiment with data from an earlier smog chamber study conducted by Los Angeles County shows that the present data lead to more stringent control strategies for oxidant reduction. The appropriateness and completeness of existing smog chamber data are discussed along with needs for additional data. (Author abstract modified)

62384 **APTIC NO. 84404**

Downing, Paul B. and Gordon Brady

IMPLEMENTING THE CLEAN AIR ACT IN LOS ANGELES. *Preprint, California Inst. of Tech., Environmental Quality Lab. and Industrial Assoc., 25p., 1975. (Presented at the Strategies for Air Pollution Control in the South Coast Air Basin Conference, Pasadena, Calif., Dec. 2, 1975.)*

An economic incentive system is proposed as an alternative to the Clean Air Act. The system authorizes the Environmental Protection Agency to impose an excess emission penalty on sources which fail to reach emission standards by the date of compliance specified in the Act. The excess emission penalty is an effluent charge based on emissions in excess of a new source emission standard. The economic system encourages compliance by preventing polluters who have failed to comply from continuing to reap a competitive advantage at the expense of those who have complied, and the amount of the penalty varies directly with the amount of emissions over the limitation. Since the polluter is liable for the penalty on a continuing basis and the penalty is dependent upon the quantity of emissions, the polluter is encouraged to comply as quickly as possible.

62385 **APTIC NO. 79733**

Dresnack, Robert

ENVIRONMENTAL ASSESSMENTS AND RELATED IMPACTS. *Water Sewage Works, 122(5):78-81, May 1975. 18 refs.*

The provisions of the National Environmental Policy Act of 1969 are discussed. The Act requires that all Federal agencies prepare an environmental assessment of any proposed action that significantly affects the environment before the action is taken. These statements must be submitted to the Council on Environmental Quality and other interested Federal agencies, and they must be made public. The Federal agencies are responsible for reviewing the environmental assessments to determine if a proposed action would have adverse effects on public health and welfare, or on environmental quality. In evaluating the assessments, the Federal agencies are required to consider the total environmental consequences, including how they might affect environmental standards: emergency standards, national air quality standards, and motor vehicle emission standards.

62386 **APTIC NO. 84130**

Dreyhaupt, Franz Josef

STRATEGY OF AIR CONSERVATION IN NORTH RHINE WESTPHALIA. *(Strategie der Luftreinhaltung in Nordrhein-Westphalen). Text in German. In: Fundamentals of Air Conservation and Noise Abatement in North Rhine Westphalia, p. 11-27, 1975. 12 refs.*

The concept of air purity conservation in Northrine-Westphalia is discussed. Conformity with German Federal Pollution Legislation is present. Load regions are defined as areas of at least 48 sq m in size in which 1 pollutant limit was exceeded or 2 pollutants reached a limit of 90% each or the sum of the ratios of pollution level and pertinent pollution limit for 3 or 4 noxa with the highest ratios exceeded the magnitude of 2, or harmful ecological effects were already manifest or feared. The entire plan was designed to protect man, animal and plant life from harmful effects due to air pollution and to prevent the occurrence of such actions, restore a polluted region, and adequate air quality. A special place in the plan is occupied by protection from acute health hazards in the event of smog. The strategic concept is composed of individual elements involving emission screening, pollution screening, effect screening and cause analysis, emission and pollution prognoses, air conservation, smog-warning service, licensing procedure, and urban and regional planning. To achieve a higher efficiency, supplementary parameters were added, such as a listing of all pollution sources in a given area, based on location and conditions of emission, calculated spread, meteorological factors and emission component analysis. The new strategy and its tactical measures should contribute to the control of excessive air pollution in the Rhine and Ruhr Regions in the foreseeable future.

62387 **APTIC NO. 84409**

Ellis, R. J.

THE IMPACT OF SULPHUR LIMITATIONS ON REFINERY FACILITIES. *Petrol. Environ. Conserv. Symp. Rep., Tehran, Iran, 1975, p. 69-94. 4 refs. (April 7-9, Paper 2.)*

The impact of sulfur limitations on refinery facilities is discussed. The effects of S limitations are highly dependent upon global and local conditions and are difficult to quantify other than in terms of large ranges. Limiting gas oils to below 0.5% wt requires the construction of additional hydrodesulfurization capacity in Western Europe. Legislation limiting gas oils below 0.3% wt results in a requirement for an expensive and high energy consuming process step for removing S. The least costly route for residue desulfurization is in a large refinery where 2.5 to 5 million ton/yr or more high S low metal atmospheric residue is available. Smaller desulfurization units or vacuum residue feedstocks is 20-40% more expensive in capital, 10-25% more expensive/ton S removed, and require up to 15% more energy. (Author conclusions modified)

62388 **APTIC NO. 76250**

Ermenc, E. D.

TRANSPORTATION CONTROL PLAN REQUIREMENTS OF CINCINNATI AND OTHER CITIES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 8p., 1975. (Presented at the Air Pollution Control Association, East Central Section Meeting, Dayton, Ohio, Sept. 17-19, 1975.)*

Federal transportation control plan requirements for Cincinnati, Ohio and other cities are reviewed. Cincinnati is the first city in the state of Ohio to be directed to institute automotive emission testing. Existing safety lanes are being used for the testing. Certification for emission testing is not currently being performed. Other cities such as Los Angeles are being required to implement much stricter transportation controls which include reductions in vehicle miles travelled, major transit improvements, and hardware retrofit. A listing of regions requiring vehicle emission controls to meet oxidant and carbon monoxide standards is provided along with the particular strategy required and the specified compliance year.

62389 **APTIC NO. 73558**

Ferrarotti, Franco, Italo Insolera, Roberto Javicoli, Luciano Pontuale, and Giuliano Prasca

ROME TODAY. *(Roma oggi). Text in Italian. Doc. Ital. Nostra, vol. 12:7-47, 1975 (?).*

City planning in Rome is discussed from the point of view of those plans and projects designed to foster a higher quality of urban life. Planned development is preferable to uncontrolled expansion. Urban expansion without scientific research should be avoided and studies dealing with the environment must be made. One effect of uncontrolled development is the addition of automobiles to the center of the city, resulting from the failure of public transportation systems to keep pace with development.

62390 **APTIC NO. 83942**

Fine, Sam D.

FOODS, DRUGS, AND COSMETICS CONTAINING FLUOROCARBON-11, FLUOROCARBON-12 AND OTHER FLUOROCARBON PROPELLANTS. MANUFACTURERS, PACKERS, AND DISTRIBUTORS. *Federal Register, 40(137):29914-29915, July 16, 1975.*

Regulations to manufacturers, packers, and distributors for submitting a list to the Food and Drug Administration of all foods, drugs, and cosmetics containing fluorocarbon-11, fluorocarbon-12, and other fluorocarbon propellants are defined. It is requested, but not required, that each registrant submit the following information: the percentage of the new weight of the product which is fluorocarbon propellant, the identity of the propellant used, and the percentages of each propellant in the product; the annual unit production of each aerosol product for each year since the introduction into interstate commerce of the product in aerosol containers; and a statement where the product is marketed over the counter or limited to prescription distribution.

62391 **APTIC NO. 79688**

Fisch, Oscar

EXTERNALITIES AND THE URBAN RENT AND POPULATION DENSITY FUNCTIONS: THE CASE OF AIR POLLUTION. *J. Environ. Econ. Manage., 2(1):18-33, Sept. 1975. 6 refs.*

External diseconomies are introduced into the standard model of urban land rent via the case of air pollution to explore the implications of law making on the urban structure. The regulatory effects of the Clean Air Act will be more than respiratory. There will be a change in urban skyline, a change in land values, a net gain in the share of the total population in the inner city of the largest metropolitan areas, and a showdown in the pace of urban sprawl. Three alternative legal arrangements of air pollution damage costs are analyzed: the recipient bears the costs; the producer bears the cost; and the compulsory use of emission control systems in the car. (Author abstract modified)

62392 **APTIC NO. 76529**

Fisher, Joseph L.

ENERGY CHOICES AND PUBLIC POLICY. *J. Air Pollution Control Assoc., 25(9):910-912, Sept. 1975.*

The environmental effects of energy policies are discussed. Any energy legislation that stimulates conservation and leads to a reduction in consumption will improve air quality. The President s proposals for changes in the Clean Air Act are aimed at conserving energy and not at avoiding pollution problems. The proposals include: postponement, extension, allowing intermittent controls on coal pollution, relaxing the non-degradation court decision, putting off auto emission standards for another 5 yr in exchange for a promise of greater fuel efficiency from the automobile industry. There is a need for national environmental goals which include: low cost, low price reliable energy supplies; environmental protection; national security; energy conservation; efficient, competitive energy industries; some protection against dislocations resulting from energy shifts, retraining for miners, regional development programs, unemployment, and compensation and a vigorous research and development program.

62393 **APTIC NO. 79699**

Foster, Charles R.

EPA EXHAUST EMISSIONS (SMOKE) STANDARDS AND FAA PARTICIPATION IN ALL EMISSION TESTING: PROPOSED COMPLIANCE. *Federal Register, 40(180):42754-42756, Sept. 16, 1975.*

The Federal Aviation Administration is considering amending Special Federal Aviation Regulation 27 to require compliance with standards for exhaust emissions of smoke applicable to aircraft turbofan or turbojet engines. The regulation previously contained only those standards that were effective beginning February 1, 1974 and the fuel venting emission standards that were effective beginning January 1, 1975. The FAA now proposed to add those provisions of Environmental Protection Agency Part 87 that apply beginning January 1, 1976. Continued compliance would be required, and would be considered to exist if the engine is maintained in accordance with applicable maintenance requirements. The amendment would prevent the issuance of type certificates, airworthiness approval tags, and standard airworthiness certificates unless the January 1, 1976 standards are complied with, and would prohibit the operation of airplanes powered by noncomplying engines after that date.

62394 **APTIC NO. 79669**

Freeman, L. Russell

NEW STATIONARY SOURCES (NSPS) AND HAZARDOUS AIR POLLUTANTS (NESHAPS). *Federal Register, 40(191):45227-45228, Oct. 1, 1975.*

Authority to implement and enforce the New Stationary Source and Hazardous Air Pollutants standards is delegated by the Environmental Protection Agency Regional Administrator to the state of California. The action is taken after a review of a request for delegation submitted on behalf of the Kern County and Trinity County Air Pollution Control Districts. Copies of the request for delegation of authority and the Regional Administrator s letter of delegation are available for public inspection.

62395 **APTIC NO. 79767**

Freeman, L. Russell

NEVADA. APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. *Federal Register, 40(159):34408-34409, Aug. 15, 1975.*

The approval and promulgation of revised implementation plans for the state of Nevada are proposed. The plan revision contains regulations for the control of particulate matter from process equipment at Basic Refractories Division, Basic Incorporated at Gabbs, Nev. A regulatory revision to the Nevada implementation plan requires a decrease in particulate matter emissions in the Nevada Intrastate Air Quality Control Region. Public comment is invited. Approval of a regulatory revision to the Nevada implementation plan concerning open burning is proposed.

62396 **APTIC NO. 82763**

French, J. G., G. C. Ortman, P. E. Brubaker, and F. B. Benson

EXPOSURE MONITORING AND COMMUNITY HEALTH STUDIES. *Preprint, 9p., 1975. 2 refs. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 18, 1975.)*

Exposure monitoring and community health studies are discussed, with particular reference to the Community Health and Environmental Surveillance Studies (CHESS) Program initiated by the Environmental Protection Agency. CHESS areas are composed of groups of three or four communities representing an exposure gradient for a pollutant but similar in climate and socioeconomic traits. Neighborhood CHESS air monitoring stations are sited to provide a representative estimate of air pollutant exposure for the study population. Pollutants measured at each station include: total suspended particulates, sulfates, nitrates, trace metals, benzpyrene, respirable particulates, dustfall, nitrogen dioxide, sulfur dioxide, oxidants, and total hydrocarbons. Reversible pulmonary function changes, acute irritation symptoms, daily mortality rates, frequency and severity of asthma attacks, aggravation of chronic respiratory disease symptoms, and aggravation of cardiac symptoms are some of the actue responses measured in the CHESS communities; while pollutant burdens, impairment of lung function, and prevalence of chronic respiratory disease comprise the long term responses measured in each community. An important finding from the CHESS studies is the fairly consistent pattern of a significant association of suspended sulfates and nitrates with exacerbation of asthma and cardiopulmonary symptoms.

62397 **APTIC NO. 76498**

Fri, Robert M.

A POLICY OF OPTIONS. *J. Air Pollution Control Assoc., 25(9):912-914, Sept. 1975.*

The relationship of energy and the environment is discussed. The National Environmental Protection Act is the most significant piece of legislation in the environmental movement because it provides a mechanism that demands detailed and explainable consideration of alternatives, particularly when irreversible commitments of resources are involved. Every energy technology has an environmental price tag. Pollution must be characterized in the earliest stages of research. Health effects must be established and thoroughly researched. The national energy research and development effort has an obligation to identify environmental effects early in the process and concurrently develop efficient environmental controls, integral to the energy technologies themselves.

62398 **APTIC NO. 73595**

Geiss, F., J. H. Petrie, P. Bourdeau, and H. Ott

THE ENVIRONMENTAL CHEMICAL DATA AND INFORMATION NETWORK OF THE EUROPEAN COMMUNITIES (ECDIN). *Preprint, Commission of the European Communities, Varese (Italy), Joint Research Centre and Brussels (Belgium), Directorate General for Science, Research and Education, 14p., 1975. (Presented at the UNEP Workshop on an International Register of Potentially Toxic Chemicals, Bilthoven, Netherlands, Jan. 6-11, 1975.)*

The Environmental Chemicals Data and Information Network of the European Communities is described. The information network is designed to provide data on chemical products of environmental significance to people engaged in environmental management and research. Relevant information is stored on chemicals produced in sizable quantities (over 500 kg/yr) and on chemicals with high toxicity. An estimated 20,000-30,000 chemicals are to be eventually stored in the system. Categories of chemicals to be stored include: chlorinated hydrocarbons, organic nitrogen compounds, organic phosphorus compounds, organic sulfur derivatives, pesticides, solvents, polynuclear aromatics, alcohols, acids, and esters among others. The system is designed to store data on production, properties, use pattern, disposal, persistence, dispersion tendency, conversion under biotic and abiotic conditions, biological consequences, and structure-activity relationships. The project is presently in a pilot phase which is likely to end in 1976. The number of chemicals to be collected during this period is some 3000-5000.

62399 **APTIC NO. 80466**

Glass, Roger I.

A PERSPECTIVE ON ENVIRONMENTAL HEALTH IN THE USSR. *Arch. Environ. Health, 30(8):391-395, Aug. 1975. 14 refs.*

Soviet methods for setting and enforcing standards for environmental pollutants were observed under the auspices of the U S-USSR agreement for cooperative research in environmental health. Since all industry is government owned, the Soviet government is the principal polluter of the environment, the regulator of environmental degradation, and the supporter of research on environmental quality control. The Sanitary Epidemiological Service, a subdivision of the Ministry of Health, coordinates the activities of many of the research institutes involved in environmental research as well as a large network of Sanepid Stations for maintaining and controlling environmental quality at the local level. The Soviet Union s distinctive view of a pollutant standard greatly influences the

environmental research that is undertaken. The centralized absolute power of the government to enforce pollution abatement had led to some improvements in environmental quality. (Author abstract modified)

62400 **APTIC NO. 76518**

Godschalk, David R. and Francis H. Parker

CARRYING CAPACITY: A KEY TO ENVIRONMENTAL PLANNING? *J. Soil Water Conserv., 30(4):160-165, July/Aug. 1975. 16 refs.*

The carrying capacity approach to environmental planning is discussed. Environmental carrying capacity is the limit at which human activity will lead to undesirable changes in the environment. The concept rests on an assumption that there are certain limits the environment itself imposes on development. Environmental carrying capacity is set at the minimum level of new activity that can be accommodated before any significant alterations result in the existing environment. Another application deals with cases where change per se is acceptable, but where the level of environmental loading is limited to that level that will not degrade certain aspects of the environment below pre-determined standards. A third application deals with the capacity of the environment to accept a new activity before the activity becomes self-limiting.

62401 **APTIC NO. 83686**

Gootjes, P.

EFFICIENCY OF AUTOMATIC ENVIRONMENTAL MONITORING INSTRUMENTS. *(Rendement van automatische milieumeetapparatuur). Text in Dutch. Chem. Weekblad, 71(46):25-27, Nov. 14, 1975.*

The economics of pollution monitoring by means of an automatic monitoring network are discussed. At this time the monitoring determines the sulfur dioxide in air, but plans for the future include determinations of nitric oxide, nitrogen dioxide, ozone, and carbon monoxide in air as well as heavy metals and chlorinated organic compounds in water. This system will be part of an anti-pollution enforcement program. The cost accounting of the present system of monitoring is discussed, concluding with a cost of 50 cents for each man, woman, and child in the Netherlands annually.

62402 **APTIC NO. 79704**

Green, John A.

STATE OF COLORADO. AIR QUALITY IMPLEMENTATION PLAN; PROPOSED REVISIONS. *Federal Register, 40(186):43923-43924, Sept. 24, 1975.*

Proposed amendments to the Colorado State Implementation Plan are presented. The proposed amendments pertain to the designation of a control region for smoking gasoline-power motor vehicles, the control of diesel-powered vehicles, permit system fees for direct sources, specific industry categories for the Standards of Performance of New Stationary Sources, vapor recovery measures in certain areas, emission limitations for the hazardous pollutants asbestos, mercury, and beryllium, and regulations to encourage motor vehicle emission reductions. Copies of the proposed amendments, documents of notice of public hearings, and the Environmental Protection Agency s preliminary analysis of the submittals are available for public inspection.

62403 **APTIC NO. 84024**

Green, John A.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS: UTAH. PROPOSED AMENDMENTS TO SO2 CONTROL STRATEGY. *Federal Register, 40(209):50280-50281, Oct. 29, 1975.*

Proposed amendments to the sulfur dioxide control strategy of Utah are announced. The amendments set up formal procedures to handle start up, shutdown, and malfunction problems that may occur at the Kennecott Copper Corp. Smelter. Problems specific to the operation of the sulfuric acid production units used as SO2 control devices are described.

62404 **APTIC NO. 84025**

Green, John A.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS: MONTANTA. PROPOSED AMENDMENTS TO THE SO2 CONTROL STRATEGY. *Federal Register, 40(209):50278-50279, Oct. 29, 1975.*

Proposed amendments to the sulfur dioxide control strategy of Montana are announced. The amendments set up formal procedures to handle startup, shutdown, and malfunction problems that may occur at the Anaconda Co. Copper Smelter. In the case of excessive emissions, the owner or operator is required to demonstrate that the excess emissions are unavoidable, that the air pollution control equipment, processes, or process equipment is operated and maintained in a manner consistent with good practice for minimizing emissions, that the cause of the excess emissions is corrected as expeditiously as practicable, that all possible steps are taken to minimize the impact of the excess emissions on ambient air quality, and that the amount and duration of the excess emissions are minimized to the maximum extent practicable. This includes curtailing bypass of strong SO2 streams around acid plants to the maximum extent practical during periods of start up, shutdown, or malfunction.

62405 **APTIC NO. 83307**

Haentzsch, Siegfried

AS EXEMPLIFIED BY BERLIN: FUNDAMENTALS OF A STATIONARY MEASUREMENT GRID FOR AIR QUALITY MONITORING. *(Am Beispiel Berlin: Grundzuegeeines stationaeren Messnetzes zur Luftgueteueberwachung). Text in German. Wasser Luft Betrieb, 19(12):693-698, 1975. 22 refs.*

The automatic real-time air pollution monitoring system established in West Berlin is described. At present, the network is composed of 13 sampling stations for sulfur dioxide concentration measurement by means of Picoflux 2 instruments by Hartmana und Braun AG. The network consists of squares with 4 km-sides. It supplies data for smog alarm, and general information to be used as the basis for decisions concerning the authorization of new emission sources. The network will be enlarged for the monitoring of carbon monoxide, ozone, nitric oxide, nitrogen dioxide, total hydrocarbons, carbon dioxide, and suspended matter, as well as for such meteorological parameters as humidity, visibility, barometric pressure, temperature, and vertical temperature gradient.

62406 **APTIC NO. 79701**

Hammer, Rebecca W.

ENVIRONMENTAL IMPACT STATEMENTS AND OTHER ACTIONS IMPACTING THE ENVIRONMENT: AVAILABILITY OF COMMENTS. *Federal Register, 40(160):34630-34632, Aug. 18, 1975.*

Draft environmental impact statements reviewed and commented upon by the Environmental Protection Agency from July 1, 1975 to July 15, 1975 are listed. The list includes a code indicating the nature of the comments. Final environmental impact statements reviewed and commented upon during the same period are also listed. The list includes a summary of the nature of the comments. Final environmental impact statements reviewed but not commented upon during this period are also listed. Another list contains actions proposed by Federal agencies, including regulations and legislation, reviewed and commented upon by the EPA during the same period. The listing includes the Federal agency responsible for the proposed action and a summary of the nature of the EPA s comments.

62407 **APTIC NO. 80336**

Hansler, M. M.

NEW YORK STATE. TRANSPORTATION CONTROL PLAN. *Federal Register, 40(149):32346-32347, Aug. 1, 1975.*

A revision to that portion of the New York State Transportation Control plan that contains the control strategy for photochemical oxidants in the Genesee-Finger Lakes region is proposed. The original plan provided for the necessary reduction through vehicle turnover, stationary source controls, and a mandatory inspection and maintenance program for light duty motor vehicles. A crucial aspect of the proposed revision request involves the effective control of hydrocarbon emissions which result from industrial processes at the Eastman Kodak Company in Rochester. Prior to Environmental Protection Agency action, it was necessary for the state to certify that a compliance schedule by which Kodak would reformulate reactive to water based solvents and control the remaining emissions using conventional methods had been obtained, thereby guaranteeing the required emission reduction necessary to obviate the need for the inspection and maintenance program in the region.

62408 **APTIC NO. 84204**

Hansmann, Klaus

NEW IMMISSION PROTECTION ACT IN NORTH RHINE WESTPHALIA. *(Neues Immissionsschutzrecht in Nordrhein-Westfalen). Text in German. In: Fundamentals of Air Conservation and Noise Abatement in North Rhine Westphalia, p. 5-10, May 1975.*

A new act was introduced in Northrhine-Westphalia to complement federal pollution regulations. Large chemical plants, coking plants, steel mills, and smaller heating installations, circular saws, lawnmowers and automobiles are included. The federal protection act established basic obligations for the construction and operation of licensed plants. No hazards, damage, or nuisances are to be caused by industrial plants, emission rates are to be technologically limited, and residues and emissions due to the operation of the plant are to be recycled if possible. Ordinances on air and noise pollution apply to vehicle performance in traffic. The new act states that antipollution measures are to be directed against those causing pollution; formation of harmful ecological effects are to be prevented as early as possible by necessary measures. Extensive, authoritative supervision and strict penalties and fines are provided for. All activities disturbing the quiet of the night are forbidden from 10 pm to 6 am. Other rulings on the use of sound-producing instruments, permits for fireworks, and disturbances by domestic animals are included. Fines of up to $3300 and imprisonment for up to 2 yr for various offenses are provided for.

62409 **APTIC NO. 84203**

Hase, Anneli

ENVIRONMENTAL LAWS AND ENVIRONMENTAL PROTECTION IN THE UNITED STATES. *(Ymparistonsuojelulait ja ymparistonsuojelu Yhdysvalloissa). Text in Finnish. Kemia-Kemi, vol. 2:475-478, Oct. 1975. 34 refs.*

The cornerstones of the environmental movement in the U. S. are the National Environmental Policy Act and the Environmental Protection Agency. One of the most important aspects of the NEPA is section 102C which obligates authorities to issue environmental impact statements before beginning operations, which can vary from building a nuclear power plant or a highway to the use of pesticides. The Technology Assessment Act of 1972 deals with new technology and its environmental impact. The first water protection law in the U. S., which was passed in 1899, the Rivers and Harbors Act, allowed the government to control waste disposal into navigable waters. It was not until 1956 that the federal government passed a law the main purpose of which was to protect the quality of water. In 1965 a federal water protection agency was established according to a law that also obliged the states to take steps against water pollution. The aim of recent water pollution legislation is to have a non-polluting industry by 1985. The primary aim of the 1970 air pollution legislation is to protect the nation's health; the secondary aim is to protect vegetation and wildlife from all known and anticipated harmful effects. The noise pollution law of 1972 works toward the creation of an environment that is free of noise that endangers the health and well-being of people.

62410 **APTIC NO. 82549**

Hauser, Thomas R. and S. David Shearer

AIR MONITORING EQUIVALENCY REGS. *Environ. Sci. Technol., 9(6):539-544, June 1975.*

The establishment of air monitoring equivalency regulations is discussed. In the promulgation of the National Ambient Air Quality Standards on April 30, 1974, the Environmental Protection Agency (EPA) presented a reference method for measuring each of the six criteria pollutants. This promulgation contains the provision that measurements be made by an equivalent method which is defined as any method of sampling and analyzing for an air pollutant which can be demonstrated to have a consistent relationship to the reference method. On Oct. 12, 1973, EPA published proposed equivalency regulations entitled Ambient Air Monitoring Equivalent and Reference Methods. This promulgation contains a description of the requirements necessary to designate a reference or equivalent method including a description of the performance specification and consistent relationship requirements. The proposal also contains necessary amendments to the Air Quality Standards and to Requirements for State Implementation Plans. Final equivalency regulations and amendments were published on Feb. 18, 1975.

62411 **APTIC NO. 83886**

Henning, Vollmer

DETERMINATION OF EMISSIONS BASED ON THE REGULATIONS IN THE TECHNICAL DIRECTIVES OF AIR CONSERVATION OF AUGUST 28, 1974. *(Ermittlung von Emissionen unter Beruecksichtigung der Vorschriften der Technischen Anleitung zur Reinhaltung der Luft vom 28. August 1974). Text in German. TUE Tech. Ueberwach., 16(10):293-297, 1975. 14 refs.*

New guidelines for the preservation of air purity, as contained in the ordinance of August 28, 1974 issued in the Federal Republic of Germany, are discussed. They refer to requirements to limit emission with regard to color of flue gas, gas plumes, and emissions of gas, dusts, and vapors. Measuring sites, a measuring program, evaluation and assessment of results, as well as a continuous emission survey and reduction measurements have been established. Measuring points for gas composition, dust content, pressure, temperature and speed should be located as closely as possible in the same measuring sector, but affecting the separate measurements as little as possible. Measurement of gas composition is performed over the cross section of a waste gas duct in 2 points simultaneously. The total length of time to find a measuring value is 2.5 hr. Installations with gas emissions of more than 100 kg/hr of sulfur dioxide, 10 kg/hr of organic compounds, 1 kg/hr of chlorine, and 20 kg/hr of nitrogen oxides, were equipped with instruments automatically recording the concentration of these substances to indicate effectiveness of initiated countermeasures.

62412 **APTIC NO. 82595**

Heywood, John B.

INSPECTION/MAINTENANCE AND RETROFIT OF IN-USE AUTOMOBILES. *In: The Automobile and the Regulation of its Impact on the Environment. Norman, Okla., Oklahoma Univ. Press, 1975, Chapt. 6, p. 231-277, 24 refs.*

The effectiveness and costs of alternative strategies for reducing exhaust emissions from automobiles are examined, with particular reference to inspection/maintenance programs and retrofit strategies. Emissions inspection appears to be the most cost effective of the different inspection options. Current estimates of the effectiveness of emissions inspection/maintenance programs are in the range of 6-12% for reduction in aggregate hydrocarbon emissions and 6-10% for carbon monoxide. The reduction in aggregate hydrocarbon and CO emissions from the successful implementation of an inspection/maintenance program is expected to be about the same as the anticipated average reduction per year during the 1975-1980 period due to new car emission controls alone. The benefits of large-scale retrofit following the implementation of emissions inspection programs are small, and the cost to the vehicle owner is high. The gain from a retrofit program applied to pre-1976 model year vehicles is anticipated to be marginal by 1979 and should decrease steadily with time. The major reason large-scale retrofit programs are of limited value is that they take too long to complete. (Author conclusions modified)

62413 **APTIC NO. 79707**

Holland, Edwin Z.

IMPLEMENTATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT, INCLUDING THE PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS. ENACTMENT OF PART. *Federal Register, 40(165):37184-37203, Aug. 25, 1975. 28 refs.*

Notice of the Civil Aeronautics Board s enactment of Part 312 of the Procedural Regulations setting forth its policies and governing procedures for the preparation and processing of environmental impact statements and related documents in connection with the Board s regulatory activities pursuant to section 102(2)(C) of the National Environmental Policy Act is given. Part 312 includes a Pollutants Screening Standard proposed by a group of nine carriers to help effectuate the threshold determination of environmental significance. The screening standard produces an order-of-magnitude estimate of the concentration of a particular pollutant at the boundaries of an airport using Environmental Protection Agency data for rates of emission and standardized meteorological conditions. The threshold standard is keyed upon the relevant units of the Primary National Air Quality Standards.

62414 **APTIC NO. 81873**

Hussey, Elaine T., R. Thuillier, D. Morrell, D. R. Mandelker, G. Hagevik, R. Mead, D. Lieberman, D. Levaggi, W. Johnson, and H. Harawitz

PROCEEDINGS OF THE CONFERENCE AIR QUALITY IMPACT ANALYSIS FOR APPLICATION IN LAND USE AND TRANSPORTATION PLANNING. JUNE 24-26, 1974. BERKELEY, CALIFORNIA. *California Univ., Berkeley, Continuing Education in City, Regional, and Environmental Planning University Extension, Office of Air and Waste Management Grant T-900345, Rept. EPA-450/3-76-009, 310p., Sept. 1975. 57 refs.*

NTIS: PB 250560/AS

Addresses from a conference on the role of air quality impact analysis in land use and transportation planning are presented. Topics covered include: the relationship between air quality management and land use regulation, institutional issues in air quality management, transportation control plans, air quality considerations for local land use planning, the relationship between air quality considerations in environmental impact statements and decisions concerning emissions allocation, the role of meteorology in air quality, the state of the art of air quality modeling, the computation and use of emissions factors and rates, meteorological modeling input, and techniques for air quality impact quantification.

62415 **APTIC NO. 82568**

Iacobelli, R. F.

THE ARIZONA INSPECTION/MAINTENANCE PROGRAM. *Preprint, Ariz. Dept. of Health Services, 6p., 1975. (Presented at the North American Motor Vehicle Emission Control Conference, 4th, Nov. 5-7, 1975.)*

The Arizona inspection/maintenance program for reducing vehicular emissions is described. The program commenced in 1969 with legislation authorizing the State Board of Health to adopt vehicular emissions standards. A voluntary inspection program was first initiated and was then followed by a mandatory prototype program and finally by a comprehensive mandatory inspection/maintenance program in Arizona s two most populated counties. Arizona s program is unique in that it incorporates a loaded test and in that the inspection network is operated by an independent contractor under the state administration and surveillance. The loaded test was used to gain a maximum reduction in ambient levels of carbon monoxide, and the independent contractor approach was selected to remain within budgetary and time constraints. (Author abstract modified)

62416 **APTIC NO. 79739**

Ishida, Ken

ON ENVIRONMENTAL CAPACITY. *(Kankyo yoryo ni tsuite). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rep. Tokyo Met. Res. Inst. Environ. Prot.), no. 6:315-320, 1975. 5 refs.*

Two concepts of environmental capacity are discussed. Concept (1) is based on the natural recuperative powers of the environment for purification and regeneration. Concept (2) is based on the administrative aspects of environmental capacity: establishment of environmental standards by determination of permissible pollution levels, based on meteorological and geographical considerations. It is suggested that Concept (1) be the definition of environmental capacity. For Concept (2), the term, permissible pollution limit, seems more suitable, and less confusing. Permissible pollution limit should be the basis for establishing total amount emission equations. It is important that flexibility be the watchword for planning policies and administrative systems in the establishment of environmental standards. It seems logical that regulations and standards should be most stringent at the local levels, less so at the prefectural levels, and least stringent at the national level.

62417 **APTIC NO. 84627**

Ishiguro, T.

PRESENT STATUS OF OFFENSIVE ODOR POLLUTION IN TOKYO AND ENVIRONMENTAL DETERMINATION METHOD. *(Tokyoto ni okeru akushu kogai no genjo to kenkyo sokuteiho). Text in Japanese. PPM (Japan), 6(12):60-70, Dec. 1975. 3 refs.*

The present status of odor pollution in Tokyo, Japan, and the method used to determine odor levels were discussed. The number of complaints filed due to odor pollution was 94, 120, 135, 198, and 291 in January, February, March, April, and May of 1975, respectively. The total number of filed complaints associated with odor emitting industries in 1974 was 1954, while in 1971 a total of 970 were registered. Complaints due to the odors from paint factories, sewage channels or rivers, and incineration facilities comprised more than 30% of the filed complaints. Of the 1954 complaints filed in 1974, 20% of these were made when the odorous substances levels exceeded the emission standards. However, for 80% of the complaints, the levels of odorous substances were within the emission standards.

62418 **APTIC NO. 83779**

Jaenicke, Martin

MODELS FROM A DEVELOPING COUNTRY. *(Vorbilder aus einem Entwicklungsland). Text in German. Umwelt (Duesseldorf), 5(6):18-21, 1975. 12 refs.*

The Chinese approach to environmental protection is discussed. Major goals of environmental protection in China are protection of health, protection of agriculture, and maintaining a frugal economy, in which recycling of wastes plays a major role. Regional planning for environmental protection seeks to limit city growth. Each city has an urban core and an agrarian periphery, making each city more or less self sufficient, thus keeping transportation costs low. The technical revolution and increased worker productivity, together with family planning, limit urban population. There is no migration from the country to the city; instead, urban workers and students are sent to work on the farms. Factories are responsible for cleaning their own wastes, and plans for new factories must include waste disposal schemes. The populace is responsible for watching out for sources of pollution and suggesting solutions. The Chinese see the relationship of growth to the environment dialectically: productivity creates environmental problems, the solution of which creates more production.

62419 **APTIC NO. 82447**

Janocha, Peter

JAPAN: POLLUTION LIMITS FOR EVERY REGION. *(Japan: Verschmutzungsgrenzen fuer jede Region). Text in German. Umwelt (Duesseldorf), 5(4):54-56, 1975. 3 refs.*

The basic traits and endeavors of environmental policy and legislation in Japan are surveyed. Recent legislation shows a departure from curative stopgap measures toward pollution prevention. A maximum allowable daily average sulfur dioxide concentration of 0.04 ppm is envisaged. Total mass emission control is imposed on 11 regions of Japan with respect to SO2. Efforts are being made to identify areas with high pollution level, and to determine the maximum allowable pollution capacity of different regions through emission prognoses. Environmental impact assessment is necessary before the establishment of new pollution sources in a given area is authorized. Environmental impact assessment, based on the statistical dispersion theory, will be extended to particulate matter, nitrogen oxides, carbon monoxides, and, if necessary, even to other pollutants. The prefectural governments exercise control over the use of heavy fuel oil and other fuels.

62420 **APTIC NO. 83159**

Janocha, Peter

JAPAN. POLLUTION LIMITS FOR EVERY REGION. *(Japan. Verschmutzungsgrenzen fuer jede Region). Text in German. Umwelt (Duesseldorf), 5(4):54-56, Aug. 1975.*

Having confronted ecological problems comparable to those of other large industrialized nations, Japan is now developing her own environmental protection policy. The first phase calls for several investigations, which would be used to establish environmental laws, emission allowances, and regulations on solid waste disposal. The second phase will seek to orient the new measures to future requirements. Environmental impact studies have been initiated by the Seto Inland Sea Environmental Protection Council and the Central Council on Pollution Control, and tolerance levels for the eleven prefectures set. These levels are based on prefecture location, type of industry, oxygen requirement, sulfur dioxide emissions and type of fuel used.

62421 **APTIC NO. 80032**

Jensen, Clayton E., Dail W. Brown, and John A. Mirabito

EARTHWATCH. *Science, 190(4213):432-438, Oct. 31, 1975. 22 refs.*

The implementation of the global environmental assessment program, Earthwatch, is described. Earthwatch is a four-part program involving monitoring, research, evaluation, and information exchange. The Global Environmental Monitoring System (GEMS) was designed to specify principles, identify program goals, priority pollutants, and related environmental factors, and to recommend a program of future work and institutional arrangments. The GEMS provides a system for monitoring particular pollutants, such as sulfur dioxide, suspended particulates, ozone, oxides of nitrogen, and carbon dioxide.

62422 **APTIC NO. 83598**

Jinnai, T.

GRAPPLING OF APA PROJECT TEAM OF AIR POLLUTION AND ASTHMA DUE TO ENVIRONMENTAL POLLUTION. PART 2. *(Taikiosen to Kogai zensoku no kansuru APA Project Team no Torikumi Part 2). Text in Japanese. Min-I-Ren Iryo (J. All-Japan. Leagues Democr. Med. Inst.), no. 43:11-12, 1975.*

The history of the APA (Air Pollution and Asthma) project concerning treatment of and protection against asthma in Kitakyushu City is described in detail chronologically. The program includes encouraging patients to mutual aid, exchanging information and experiences concerning treatment, administration matters concerning the health of patients and their families, and efforts toward preventing the damage due to environmental pollution and toward promoting compensation for the damage.

62423 **APTIC NO. 83157**

Johann, Hubert-Peter

INDUSTRIAL INSPECTORS FOR EMISSION CONTROL. A POSITION NEEDS PROFILE. *(Betriebsbeauftragter fuer Immissionsschutz. Ein Amt wartet auf Profil). Text in German. Umwelt (Duesseldorf), vol. 5(4):13-14, Aug. 1975.*

During the course of talks on the German federal emissions law, the inspector was viewed as a mediator between federal authorities and the commercial and industrial sectors. Each views the inspector differently and it is his job to define his position in order to avoid adversity from either side. The ambivalence of this problem is considered with respect to compromises for ecological protection and industrial management. With central orientation of environmental problems, the commercial and industrial sectors should consider uniform programming, representation outside, acquisition and exchange of data for problem solving, advice and utilization of current measuring equipment as well as cooperation in investments and information for the public.

62424 **APTIC NO. 79172**

Jurgens, Robert B.

EPA S REGIONAL AIR POLLUTION STUDY (RAPS). *In: OR and D ADP Working Proceedings No. 1, Environmental Protection Agency, Washington, D. C., Office of Research and Development, Rept. 600/9-75-002, p. 148-155, Jan. 1975. (Presented at the Office of Research and Development Automatic Data Processing Workshop, Bethany, W. Va., Oct. 2-4, 1974.)*

NTIS: PB 241 150

The Environmental Protection Agency s Regional Air Pollution Study (RAPS) is described. The goal of RAPS is the development and evaluation of Air Quality Simulation Models which can be used in least-cost air pollution control strategies relative to EPA s current standards. These models can, for example, help in designing state pollution control implementation plans. The criteria for choosing a region include having a city with significant air pollution which is isolated from an influx of air pollution from surrounding areas and which possesses a relatively simple topography. The St. Louis area met these criteria and was thus chosen for regional studies. The AQSM associated with the St. Louis RAPS includes four functional modules: an emissions model describing the location and temporal variations of emission rates of pollutant sources, atmospheric transport and diffusion, atmospheric chemical reactions of primary and secondary sources, and removal processes such as rain and dry deposition or absorption by vegetation. The RAPS emission inventory encompasses 12 separate source categories, and individual methodologies are being designed for collecting emission inventories on an hourly basis. Paralleling the development of an emissions inventory is the establishment of a Regional Air Monitoring System. The RAMS measurements include monitoring for sulfur dioxide, total sulfur, hydrogen sulfide, ozone, nitrous oxide, nitrogen dioxide, methane, total hydrocarbons, total suspended particulates, visibility, and several meteorological variables. A FORTRAN command program is provided for all user requests, and all results come back to the user through a main program.

62425 **APTIC NO. 80301**

Kantawala, D. C.

PLANNING FOR POLLUTION CONTROL. *Indian Chem. J. (Bombay), 10(2):42-48, Aug. 1975. 62 refs. (Presented at the Seminar on Pollution and Human Environment, Bombay, India, Aug. 1970.)*

The various methods available to control industrial pollution by proper planning are discussed. In air pollution control, zoning is gaining momentum because all the four steps leading to air pollution, production, emission, transfer, and reception, are amenable to land use planning in the form of zoning. The location of sources of production, the amount emitted and the land uses that cause air pollution damage can be subjected to principles of planning and zoning. The planning authorities in Great Britain advocate a greenbelt area to separate industry and its emissions from human populations. A similar idea exits in the USSR to remove habitation from an area 2 kilo in radius surrounding refineries and other specified industrial activity.

62426 **APTIC NO. 84705**

Karasawa, M.

GENERATION MECHANISM AND EFFECTS ON LIVING THINGS OF PHOTOCHEMICAL SMOG. *(Kogagaku sumoggu no hassei kiko seitai e no eikyo). Text in Japanese. PPM (Japan), 6(8):79-84, Aug. 1975.*

The cost of pollution control research is reviewed. Since 1973, an overall Research Project concerning urban-type complex air pollution such as photochemical smog has been organized, to promote research on the generation mechanism of photochemical smog, effects of complex air pollution on living things, technology to measure air pollution, and technology to control emission of air pollutants. Studies on photochemical reaction mechanisms and substances generated after reaction have been carried out by local environmental hygienics departments and the National Public Health Institute during 1971-1973. Various methods of measurement of substances considered to affect humans were developed. Experiments on various chemical reactions were carried out also. Studies of relationships between complex air pollution and local meteorological phenomena, and automobile exhaust were conducted by the Agency of Industrial Science and Technology from 1967 to 1974.

62427 **APTIC NO. 83542**

Kasahara, Mikio

A CONSIDERATION OF ENVIRONMENTAL POLLUTION BY AUTOMOBILE. *(Jidosha haigasu no kankyoosen hyoka ni kansuru ichi kosatsu). Text in Japanese. Preprint, Japan Society of Civil Engineers, Tokyo, p. 21-26, 1975. 3 refs. (Presented at the Environmental Problems Symposium, 3rd, Tokyo, Aug. 22-23, 1975.)*

Environmental assessment using auto exhaust gas as an index is proposed. The characteristics of autos as a source of pollution are: the volume of pollutants emitted varies according to each automobile and each operational speed and fuel used; pollutants are emitted at very low altitude, near the ground, and they diffuse in accordance with the movement of the auto. The purpose of environmental pollution assessment by auto exhaust emission is to lower the level of pollution on highways and in surrounding areas, and to lower the level of pollution in an extensive area. Discussions of the following subjects are given: a method for determining an air pollutant emission coefficient for automobiles; extensive area pollution assessment; limited area pollution assessment; and maintenance of the environment. At present, these subjects are under investigation by the Research and Investigation Committee for Auto Exhaust Emission Gas.

62428 **APTIC NO. 83955**

Kasuga, N.

ON THE ENVIRONMENTAL STANDARD OF NITROGEN OXIDES. *(Chisso sankabutsu no kankyo kijun o megutte). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 22(10):559-561, Oct. 1975. 8 refs.*

A general discussion is of environmental standards for nitrogen oxides is given. Environmental standards are usually established based on four basic concepts: standard, guideline, goal, and criteria. The environmental standards in the United States are mainly based on standards. Primary standards for human beings and secondary standards for crops and other properties are established. The fundamental law for pollution control in Japan states that standards are to be established to protect human health and to preserve living environments. Previous laws which required the environmental standards to be established in accordance with healthy development of the economy were abolished at a meeting of parliament in 1975. The environmental standards of NOx in Japan are based on the first and the second levels given in the WHO criteria.

62429 **APTIC NO. 76562**

Kato, Tatsuo

TRENDS IN MALODOR CONTROL LAWS. *(Akushu boshi hoki no doko). Text in Japanese. Anzen Kogaku (J. Japan Soc. Safety Eng.), 14(5):333-338, Oct. 1975.*

Problems of malodor control regulations are discussed. Malodor control regulations have been in effect since June 1971. Malodors differ from air and water pollutants, in that chemicals which are harmful to the body in ppm concentrations, can be obnoxious at ppb concentrations. Malodors can result from exhaust gases, and/or from effluent, and the two cannot be treated separately. Pulp, petroleum, and livestock-related industries are major offenders. For malodor control, subjective sniff tests should be combined by gas chromatography, which will give quantitative and qualitative evaluations of the chemicals involved. It is possible to divide the actual malodor component concentration by its threshold concentration, to determine workable relationships between malodor components and malodor strengths. In effluents containing ppm concentrations of malodor components, Henry s Law was found to be applicable. Quantitative determinations of substances (vinyl chloride, chloroform in ppb quantities) is possible. Malodor regulations covering 20 substances (5 substances currently regulated) would probably take care of the majority of odor complaints. However, environmental quality would certainly be sacrificed by mere adherence to the letter of the law.

62430 **APTIC NO. 80051**

Kobayakawa, Takashi

PRESENT SITUATION AND ITS FUTURE IN AUTOEXHAUST GAS CONTROL (I). *(Jidosha haishutsu gasu kisei no genjo to shorai (I)). Text in Japanese. Kikai no Kenkyu (Science of Machine), 27(4):507-514, April 1975.*

The present status and future problems of automobile exhaust control in Japan are discussed with respect to future exhaust control standards which are contemplated. The Japanese government has already decided on the most severe standards for 1976: 0.25 g/km for carbon particles, 2.1 g/km for carbon monoxide, and 0.6 g/km for nitrogen oxides. All these values are about 1/4 of the United States standards for the same year. Because of the severity of the standards, the concentration of injurious gases in Japan has decreased in the past several years, and since 1970, for example, it is quite unusual to have over 10 ppm of CO even in Tokyo. Simply reducing the concentration of NOx and HC has had no influence on photochemical smog, as studies in California showed. In order to prevent the occurrence of photochemical smog, the ratio of HC to NOx concentrations should not be 1, and this must be taken into account for the evolution of legal standards.

62431 **APTIC NO. 79919**

Kollar, Katalin, Gyorgy Tasnadi, Laszlone Raduj, and Gyorgy Sardi

AUTOMATIC AND CONTINUOUS AIR POLLUTION MEASUREMENTS. *(Automatikus es folyamatos levegoszennyezodesi meresek). Text in Hungarian. Energiagazdalkodas, 16(7):329-335, July 1975.*

Automatic and continuous air pollution monitoring networks operated in different countries of Europe and in Japan are reviewed. The automatic monitoring network installed in and around Frankfurt am Main in West Germany for sulfur dioxide measurements is completed with sampling stations for carbon monoxide, nitrogen, oxides, oxidants, and total hydrocarbons at 3 and 20 m altitudes. The SO2 concentrations and meteorological parameters are continuously recorded in the network in Rotterdam, and the Dutch national monitoring network, now under construction, will be linked up with the West German national network. Regional automatic, continuous networks are operated in Czechoslovakia, France, and Japan. Automatic, continuous monitoring is conducted of the SO2, CO, and carbon dioxide concentrations at one sampling station in the center of Budapest, and random measurements are conducted at another 34 sampling stations in that city.

62432 **APTIC NO. 83428**

Kozlowski, Richard G. and Jeffrey E. Howard

THE ENVIRONMENTAL PROTECTION AGENCY S PROGRAM TO MORE EFFECTIVELY IMPLEMENT THE SECTION 207(A) PRODUCTION WARRANTY OF THE FEDERAL CLEAN AIR ACT. *Preprint, Environmental Protection Agency, Washington, D. C., Mobile Source Enforcement Div., 25p., 1975. 4 refs. (Presented at the North American Motor Vehicle Emissions Control Conference, Annual, 4th, Anaheim, Calif., Nov. 5-7, 1975.)*

Possible options for the development of an Environmental Protection Agency program to more effectively implement the emissions control production warranty provision (207(a)) of the Clean Air Act are reviewed. The program is intended to provide general clarification concerning the coverage of the provision. Possible options include: the development of a list of emissions-related components, with consumers still having the burden of justifying claims; the development of a list of failures presumed to be covered by the warranty; the imposition of selected reporting requirements on vehicle manufacturers; a requirement specifying that manufacturers include a log book format for maintenance instructions; and a requirement that manufacturers notify consumers of claims not honored.

62433 **APTIC NO. 84099**

Kremer, Gottfried, Rolf Weber, Hermann Erich Schwarz and Ernst Kutscheidt

A LAW AND ITS CONSEQUENCES - FOUR OPINIONS. *(Ein Gesetz und seine Folgen - vier Meinungen). Text in German. Umwelt (Duesseldorf), 5(6):26-35, 1975.*

There have been many opinions concerning the implications of the German Federal Emissions Law of 1973 (BImSchG), four of which are presented here. The consequences for the chemical industry are treated in view of civil comanagement in the public interest. Restrictions on selection of industrial sites and investments in existing sites may lead to unfair competition. It also seems that the sections on clean air do not provide for the regulation of operations in plants subject to authorization. Consideration is also given to the legal problems created by the BImSchG, which involve the application of statutes to current cases under review.

62434 **APTIC NO. 84227**

Kremer, G.

FEDERAL IMMISSION PROTECTION ACT AND LICENSING PROCESSES. FIRST PRACTICAL EXPERIENCES. *(Bundes-Immissionsschutzgesetz und Genehmigungsverfahren. Erste Erfahrungen aus der Praxis). Text in German. Chem. Ind. (Duesseldorf), 27(11):652-654, 1975.*

After 1 1/2 yr of the enforcement of the German Federal Antipollution Law, experiences with it were reviewed and additional measures which might make it more effective were considered from the viewpoint of the chemical industry. This survey stressed the numerical distribution of license applications for refineries, power plants, and medium-sized and smaller operations to be expected and the differentiation of licensing procedures with consideration of the public interest, the applicants, and the authorities involved. The chemical industry pointed out that at least 70-80% of all licensing applications concerned smaller and medium-sized operations planned within the framework of existing industrial plants. They were equipped with modern antipollution devices and would not result in a change of the regional ecology. The actual duration of the licensing process lasted more than 6 mo and should be shortened. Industry is under an obligation to supply complete and convincing documentation and the authorities should rely on their technical competence to speed up the procedure. Toward that end, formalization of the application procedure, shortening the disclosure term from 2 to 1 mo, reaching the decision within 6 mo, and keeping licensing authorities to a minimum were suggested. In large projects, the problem of procedural duration and its integration into planning and preparation was significant. Applications should be thoroughly prepared for the sake of quick decisions. Construction planning should be compatible with industry and residential area alike. New anti-noise legislation would be required to deal with traffic, construction, and industrial noise as well as noise from private activity, including street noise. The public should be taught the difference between a decision on leisure facilities planning and a decision on building an industrial installation, tomorrow s workplace. The latter should be in the hands of technical experts.

62435 **APTIC NO. 76053**

Kulujian, Norman J.

INSPECTION MANUAL FOR THE ENFORCEMENT OF NEW SOURCE PERFORMANCE STANDARDS: PORTLAND CEMENT PLANTS (FINAL REPORT). *PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-1355, Task 4, Rept. EPA-340/1-75-001, 100p., Sept. 1975. 16 refs.*

NTIS: PB 245849/AS

Guidelines for the enforcement of New Source Performance Standards at portland cement plants are presented. The guidelines provide a summary of the New Source Performance Standards, a description of the process and emissions generated by it, applicable control methods, monitoring instrumentation, performance tests, and procedures for periodic inspection. Suggestions for the writing of reports and keeping of records are also provided. Exhaust gases from kilns, clinker coolers, and dry milling systems constitute the larger emission sources in portland cement plants. Dust emissions from the kiln account for the largest portion of particulate emissions from cement plants.

62436 **APTIC NO. 80458**

Kumazawa, Yasumasa

PROBLEMS CONCERNING CONTINUOUS ENVIRONMENTAL MONITORING SYSTEMS. *(Kankyo joji kanshi no mondaiten). Text in Japanese. Preprint, Society of Instrument and Control Engineers, Kansai Section, p. 9-18, 1975. 6 refs. (Presented at the Determination of Environmental System and Modeling Symposium, Osaka, Japan, Sept. 18, 1975.)*

Problems concerning continuous monitoring of air and water pollution are summarized. Development of economical standard monitoring installations, involving little manpower and maintenance, containing fail-safe features, of good durability, stability, and sensitivity, is necessary. A single numerical index, which can represent total environmental pollution level, is desirable. Previously, sulfur dioxide concentrations had been used as pollution indices, but such indices are no longer valid, in most circumstances. To prevent economic losses to enterprises forced to curtail activities because of pollution alerts, an accurate prediction system, with good communications, must be developed. The international data bank on pollution, established by WHO as a pilot project, uses standardized air pollutant data reporting and interpretation techniques. Automatic monitoring of environmental water quality lacks urgency most of the time, and has many technical difficulties. Metropolitan Tokyo has established continuous water monitoring at 27 locations (1974). The sampling system utilizes high- speed flow-through, and measures water temperature, pH, dissolved oxygen, electrical conductivity, turbidity, chloride, ORP, cyanide, hexavalent chromium, phenol, total mercury, TOC.

62437 **APTIC NO. 79740**

Kuramoto, Yoshihisa

SIGNIFICANCE OF FACT-FINDING SURVEYS ON INVESTMENT IN ENVIRONMENTAL POLLUTION CONTROL FACILITIES BY ENTERPRISES AND OBSERVATIONS REGARDING SURVEY METHODS. *(Kigyo ni yoru kogai boshi setsubi toshi no jittai chosa no igi to sono chosa hoho ni kansuru kosatsu). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rep. Tokyo Met. Res. Inst. Environ. Prot.), no. 6:311-314, 1975.*

Discrepancies between expenditures by industries on positive environmental pollution control facilities (e.g., purification installations) and pollution amelioration facilities (e.g., stacks (over 70 m high) which disperse pollutants but do not treat them) are discussed. Although apparent industrial expenditures for pollution control facilities have increased yearly since 1965, when surveys were begun by MITI (3.1% of total expenditures in 1965; 9.8% in 1973), there are inherent faults in the surveys. One fault is concentrating the surveys on big enterprises (1271 businesses, 1973), and ignoring small and medium-sized enterprises, such as those located in profusion in Metropolitan Tokyo. Another fault lies in the wording of the surveys, which do not always differentiate between positive environmental pollution control facilities, and pollution amelioration facilities. It is misleading to include costs of relocation and mere stack construction, for example, in pollution control installation expenditures. It is necessary to establish objective definitions of pollution control installations and pollution control installation expenditures.

62438 **APTIC NO. 84168**

Lamm, L. P.

CHAPTER I -- FEDERAL HIGHWAY ADMINISTRATION, DEPARTMENT OF TRANSPORTATION. PART 633-- REQUIRED CONTRACT PROVISIONS. FEDERAL-AID CONSTRUCTION CONTRACTS (OTHER THAN APPALACHIAN CONTRACTS). *Federal Register, 40(181):42867-42872, Sept. 17, 1975.*

Regulations for federal aid to highway construction are amended. The amendments cover required contract provisions for employment, record of materials and supplies, subletting or assigning the contract, safety, false statements, termination of contract, and implementation of the Clean Air Act and the Federal Water Pollution Control Act. Facilities listed on the Environmental Protection Agency List of Violating Facilities are not to be used in the performance of the contract. The contractor must notify the State Highway department if he receives any communication that a facility to be utilized for the contract is under consideration to be listed. Compliance with requirements of the Clean Air Act is required by the contract. The environmental requirements also supply to subcontracts.

62439 **APTIC NO. 79681**

Lee, Dwight R.

EFFICIENCY OF POLLUTION TAXATION AND MARKET STRUCTURE. *J. Environ. Econ. Manage., 2(1):69-72, Sept. 1975. 5 refs.*

The efficiency of a uniform pollution tax in achieving a given level of pollution abatement at least cost is analyzed. Market structure is an important consideration in this performance, and least cost abatement does not result from a pollution tax uniformly applied. The pattern of pollution taxes that will achieve least cost abatement when differing degrees fo market power exist among polluters is developed and discussed. (Author abstract modified)

62440 **APTIC NO. 76401**

Legro, Stanley W.

PART 60 -- STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCE. DELEGATION OF AUTHORITY TO STATE OF COLORADO. *Federal Register, 40(211):50718-50719, Oct. 31, 1975.*

The Environmental Protection Agency is amending the Code of Federal Regulations to reflect the delegation of authority for the standards of performance for 11 categories of new stationary sources to Colorado. The amendment adds the address of the Colorado Air Pollution Control Division, to which reports, requests, applications, submittals, and communications must be addressed. The amended paragraph is included.

62441 **APTIC NO. 79672**

Legro, Stanley W.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS. DELEGATION OF AUTHORITY TO STATE OF CALIFORNIA ON BEHALF OF KERN COUNTY AND TRINITY COUNTY AIR POLLUTION CONTROL DISTRICTS. *Federal Register, 40(191):45171, Oct. 1, 1975.*

Chapter I, Title 40 of the Code of Federal Regulations is amended by the Environmental Protection Agency pursuant to the delegation of authority for National Emission Standards for Hazardous Air Pollutants to the state of California on behalf of the Kern County Air Pollution Control District and the Trinity County Air Pollution Control District. The amended section 61.04 includes the addresses of the Kern and Trinity County Air Pollution Control Districts to which must be addressed all reports, requests, applications, submittals, and communications pursuant to this part by sources subject to the NESHAPS located within these air pollution control districts.

62442 **APTIC NO. 79675**

Legro, Stanley W.

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES. DELEGATION OF AUTHORITY TO STATE OF CALIFORNIA ON BEHALF OF KERN COUNTY AND TRINITY COUNTY AIR POLLUTION CONTROL DISTRICTS. *Federal Register, 40(191):45170-45171, Oct. 1, 1975.*

The Environmental Protection Agency is amending 40 CFR 60.4 to reflect the delegation of authority for the Standards of Performance for New Stationary Sources to the state of California on behalf of the Kern County and Trinity County Air Pollution Control Districts. The amended section includes the addresses of the two districts to which must be addressed all reports, requests, applications, submittals, and communications pursuant to this part by sources subject to the NSPS located within these air pollution control districts.

62443 **APTIC NO. 80022**

Legro, Stanley W.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS. DELEGATION OF AUTHORITY TO STATE OF COLORADO. *Federal Register, 40(211):50719, Oct. 31, 1975.*

The delegation of authority for national emission standards for hazardous air pollutants to the State of Colorado is announced. The address of the Colorado Air Pollution Control Division to which all reports, requests, applications, submittals, and communications to the Administrator must be addressed is included.

62444 **APTIC NO. 80135**

Legro, Stanley W.

PART 60 -- STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES. DELEGATIONS OF AUTHORITY TO STATE OF CALIFORNIA ON BEHALF OF BAY AREA, MONTEREY BAY UNIFIED, HUMBOLDT COUNTY AND DEL NORTE COUNTY AIR POLLUTION CONTROL DISTRICTS. *Federal Register, 40(177):42194-42195, Sept. 11, 1975.*

The Environmental Protection Agency is amending the Code of Federal Regulations to reflect delegation of authority for the standards of performance for new stationary sources (NSPS) to the State of California on behalf of the Bay Area, Monterey Bay Unified, Humboldt County, and Del Norte County Air Pollution Control Districts. The amendment adds the addresses of these districts, to which communications must be addressed by sources subject to the NSPS that are located within these Air Pollution Control Districts. The amendment is given.

62445 **APTIC NO. 83809**

Legro, Stanley W.

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCE. DELEGATION OF AUTHORITY TO STATE OF NEW YORK. *Federal Register, 40(200):48347, Oct. 15, 1975.*

The address in the state of New York for the office of the Standards of Performance for New Stationary Sources is announced. All reports, requests, applications, submittals, and communications to the Environmental Protection Agency should be addressed to the New York Department of Environmental Conservation.

62446 **APTIC NO. 84306**

Legro, Stanley W.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS. DELEGATION OF AUTHORITY TO STATE OF NEW YORK. *Federal Register, 40(200):48347-48348, Oct. 15, 1975.*

The address in the State of New York for the office of the National Emission Standards for Hazardous Air Pollutants is announced. All reports, requests, applications, submittals, and communications to the Environmental Protection Agency should be addressed to the New York Department of Environmental Conservation.

62447 **APTIC NO. 82636**

Ludwig, F. L. and R. T. H. Collis

AN EXAMPLE OF THE USE OF MONITORING AND MODELING FOR EVALUATING AIR POLLUTION CONTROL PLANS. *Preprint, Stanford Research Inst., Menlo Park, Calif., 4p., 1975. 1 ref. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

Alternative strategies for improving air quality in Sarajevo, Yugoslavia were evaluated using air monitoring data and diffusion modeling. Daily sulfur dioxide and soot concentrations were monitored for about 10 yr to provide data for the application of a climatological dispersion model. The model was used to evaluate three alternative pollution control measures: the use of oil and solid fuels with reduced sulfur and ash content, the installation of a large central heating plant with a tall stack, and the use of natural gas for domestic heating. The first alternative, although not as effective as the other two, appeared capable of reducing maximum SO2 concentrations to about one-third of the values projected if no measures were taken. The use of central heating or natural gas appeared to be too expensive to warrant the resulting improvement in air quality over the first alternative.

62448 **APTIC NO. 84156**

Maedler, R.

THE HANDLING OF COMPLAINTS FROM THE PUBLIC CONCERNING AIR POLLUTION AS TASK OF THE PUBLIC AUTHORITIES. *(Die Bearbeitung von Klagen aus der Bevoelkerung ueber die Luftverschmutzung als behoerdliche Aufgabe). Text in German. Gesundheitstech., (11):261-262, 1975. 2 refs.*

The handling and processing of complaints by Swiss municipal or cantonal authorities concerning offensive smoke, dust, smells, and noise is discussed. Well-organized dealing with complaints can be a significant instrument in the fight against air pollution. Its chief use is for the control of olfactory pollution determinable only by the human sense of smell. The main sources of offensive odors were found to be attributable to faulty construction of operation of oil-heating installations, wood heating, sausage smoking, coffee roasting, garbage disposal (purification plants, dumps, garbage incinerators) and industrial and commercial processes, such as soap manufacture, tanneries, and chemical processes. A cybernetic complaint scheme was developed involving steps from receiving the complaint to settling it. It led to specifications and quantifications of the objective to be reached. Coordination with authorities (police, construction-supervisory authorities) was very important and prevented contradictory decisions. Processing of the complaint is the most direct point of contact between the authority and taxpayer/voter. Statistical data from the Zurich Sanitary Inspection Department Division for Atmospheric Hygiene show that of 160 complaints annually processed, 110 were settled within 1 yr, 140 within 2 yr.

62449 **APTIC NO. 82598**

Malmberg, Kenneth B.

EPA DEMOLITION AND RENOVATION INSPECTION PROCEDURES. *Environmental Protection Agency, Washington, D. C., Stationary Source Enforcement Div., 25p., Oct. 1975. 3 refs.*

Environmental Protection Agency demolition and renovation inspection procedures are outlined with particular reference to the control of asbestos particulate emissions. Topics covered include: preinspection and inspection procedures involving safety and equipment considerations, Federal Register requirements, visible emissions, and sampling procedures; sample custody and reporting procedures; and case development considerations. Inspections are initiated by the regional EPA office, and the state or local air pollution control agency is notified of pending inspections and the right to accompany the EPA inspectors. Wetting is the primary procedure specified for controlling asbestos emissions. However, local exhaust ventilation and collection systems may be used instead when damage to equipment resulting from wetting is unavoidable.

62450 **APTIC NO. 83446**

Malmberg, Kenneth B.

EPA VISIBLE EMISSION INSPECTION PROCEDURES. *Environmental Protection Agency, Washington, D. C., Div. of Stationary Source Enforcement, 69p., Aug. 1975. 6 refs.*

Procedures for the performance of visible emission evaluations of process operations by Environmental Protection Agency inspectors are presented. Guidelines are provided for defining acceptable field techniques for making opacity evaluations in connection with compliance monitoring and enforcement case development. Topics covered include: pre-entry procedures, entry and inspection procedures, report writing, and the use of photography. The procedures are designed to insure that the inspector is capable of providing consistent, accurate, and confident responses to examination in judicial proceedings.

62451 **APTIC NO. 79788**

Marchesani, Vincent J., Joseph N. DePierro, Terrence A. Juchnowski, Ralph J. Pfannenstiel, John J. Serkies, and Althea S. Thornton

NEW JERSEY AIR QUALITY INDEX. *Atmos. Environ., 9(6/7):683-686, June/July 1975. 15 refs. (Presented at the American Institute of Chemical Engineers National Meeting, New Orleans, La., March 11-15, 1973.)*

The New Jersey Bureau of Air Pollution Control began publishing a daily Air Quality Index on May 15, 1972, based on data from air monitoring stations throughout the state. The Index provides information on levels of four pollutants: carbon monoxide, sulfur dioxide, smoke shade, and oxidants. Actual concentrations in microgram or mg/cu m are presented. The concentrations are directly comparable to national Ambient Air Quality Standards for the contaminants. An overall daily rating and a forecast rating for the following day are also supplied. (Author abstract)

62452 **APTIC NO. 82775**

Masser, Charles C.

WHAT IS THE REGIONAL AIR POLLUTION STUDY? *Preprint, Purdue Univ., West Lafayette, Ind., 13p., 1975. 2 refs. (Presented at the Purdue Air Quality Conference, Annual, 14th, Indianapolis, Ind., Nov. 12-13, 1975.)*

The Regional Air Pollution Study which encompasses the St. Louis Air Quality Control Region is described. The study is the largest and most comprehensive attempt to date to obtain a quantitative understanding of urban air pollution. Its aim is to describe the complex relationships between emissions to the atmosphere, atmospheric dispersion and transformation processes, and ambient concentrations of pollutants. The RAPS emission inventory is planned to provide hourly data for key pollutants based insofar as possible on measured values. Thus, emission data are to be obtained for a base period of a year, commensurate in detail and accuracy with data on ambient concentrations and micrometeorological information gathered by the Regional Air Monitoring Stations. (Author summary modified)

62453 **APTIC NO. 83688**

Matsuda, Masahiko, Shinshu Miyamoto, Shigeru Kobayashi, Makoto Yanami, Yoshiaki Fuchi, and Takashi Masuda

REPORTS ON OFFENSIVE ODOR SUBSTANCE IN NAGASAKI PREFECTURE. NO. 3. *(Nagasaki ken ni okeru akushu busshitsu chosa seiseki. 3). Text in Japanese. Nagasaki ken Eisei Kogai Kenkyusho Ho (Annu. Rep. Nagasaki Inst. Health Environ. Sci.), no. 14:18-23, Dec. 1975.*

The Nagasaki Prefectural Institute of Health and Environment conducted a survey in 1974 on malodorous substances. Eleven industries were studied; a total of 187 inspections were made. Compared to the result of the previous year when a large number of industries could not meet the environmental standard for malodorous substances, this year, only certain industries failed to meet the standard (the fish and animal wastes treating industry and the feather treating industry in particular). The malodorous substances were ammonia, hydrogen sulfide, methyl mercaptan, methyl sulfide and trimethylamine. No plants failed to meet the environmental standard for hydrogen sulfide and methyl sulfide.

62454 **APTIC NO. 76566**

Matsunami, M.

ON THE INTRODUCTION OF PUBLIC DISCLOSURE SYSTEMS FOR CLEANNESS RATING FOR EXHAUST GASES FROM LOW-POLLUTION CARS. *(Teikogaisha no haishutsu gasu ni kakawaru kurin-do kohyo seido no donyu ni tsuite). Text in Japanese. Toransupoto (Transportation), 25(9):1-8, Sept. 1975.*

Different models of Japanese automobiles are required to undergo standard emission tests (10-mode, 11-mode) at a laboratory operated by the Ministry of Transportation. Resultant carbon monoxide, hydrocarbon, and nitrogen oxides emission values are publicly disclosed. Emissions from test runs on the chassis dynamo are captured with a constant volume sampler. Amounts of gas components in terms of g/km or g/test, are determined by non-dispersive infrared analyzer, hydrogen flame ionization analyzer, and chemiluminescence analyzer. Systems to reduce emission pollutants include catalytic reaction (for CO reduction), exhaust recombustion (thermal reactors, for HC reduction), stratified combustion, and exhaust gas recirculation. The rotary engine lowers NOx levels. As of September 1975, 41 models of cars have met 1975 Japan emission standards and 25 models have met 1976 standards. Public disclosure of emission levels is meaningless, unless the public is willing to choose the automobiles with lower pollutant levels.

62455 **APTIC NO. 84055**

Matsushima, A.

THE APA TEAM PROJECT ON AIR POLLUTION AND ASTHMA DUE TO ENVIRONMENTAL POLLUTION PART 1. *(Taikiosen to kogai zensoku ni kansuru APA project team no torikumi Part 1). Text in Japanese. Min-I-Ren Iryo (J. All-Japan Leagues Democr. Med. Inst.) no. 43:10-11, 1975.*

The APA (Air Pollution and Asthma) project team was organized in Feb. 1975 to deal with the air pollution problem in North-Kyusu, with 3 physicians, 4 nurses, 3 pharmacists and several researchers, totaling 23. It has three departments: epidemiological, clinical (interval medicine and pediatrics) and social-medical. The roles of the three departments are explained. Some fundamental objectives were chosen: promoting the treatment of patients of respiratory diseases with the systematic collection and accumulation of clinical data; organizing a party of asthmatic patients in Kitakyshy; promoting cooperation with local citizen's organizations and associations of doctors on health insurance; engaging the cooperation of public health research laboratories and universities to develop highly scientific research based on epidemiological surveys; and obtaining authority to officially determine which patients are suffering the effects of pollution.

62456 **APTIC NO. 84220**

Matsuzaki, N.

SYSTEM APPROACH TO REGIONAL PROBLEMS. *(Chiiki mondai e no shisutemu apurochi). Text in Japanese. Nihon Kikai Gakkai-shi (J. Japan Soc. Mech. Engrs.), 78(679):38-44, June 1975. 24 refs.*

Systems for forecasting air pollution with the use of a computer are described. An on-line simulation system using graphic display, has been used to supplement the traditional monitoring system function. For overall control of local areas, three subsystems are required: an effective forecasting system, a system for organs of adjustment (e.g., Delphit method, Dematel repeated questionnaire system), or establishment of and a basic control system, which consists of environmental control and land use control. The land use control system checks the feasibility and adequacy of development programs.

62457 ***APTIC NO. 79613***

Matthews, William H.

OBJECTIVE AND SUBJECTIVE JUDGEMENTS IN ENVIRONMENTAL IMPACT ANALYSIS. Environ. Conserv., 2(2):121131, Summer 1975. 18 refs.

The analysis of environmental impacts requires both objective and subjective judgements at almost every stage. The types of objective and subjective judgements that are made in each of the following major steps of the analysis are outlined: identifying major activities; selecting environmental components; selecting types of impacts; assessing the possibilities or probabilities of occurrences; determining the degree of the impacts; determining the time frame of impacts; designating impacts as positive, neutral, or negative; and determining trade-offs among activities and impacts. If great care is not taken in making these judgements, and in making very explicit the value framework used, the effectiveness and credibility of the analyst may be sharply reduced. There is also the danger that society and its decision makers will be presented with an analysis having so many built-in biases that the legitimate role of the decision makers in assessing the analysis and then making important value trade-offs is seriously compromised. (Author abstract modified)

62458 **APTIC NO. 79671**

Matthews, William H. and Joseph C. Perkowski

INTEGRATING SCIENTIFIC KNOWLEDGE FOR PROFESSIONAL EDUCATION IN ENVIRONMENTAL MANAGEMENT. *Environ. Conserv., 2(3):213-222, Autumn 1975. 27 refs.*

A conceptual and substantive base for developing programs of professional education in environmental management is presented. The conceptual framework is based on a simplified model of the decision-making steps in environmental management processes. This type of model can be used for isolating certain types of decisions and roles in different social, cultural, administrative, or political contexts. Once this is done, the responsibilities and educational needs of specific classes of environmental managers can be identified through studies and interviews. Major subject areas treated in the model include: values and perceptions, ecology, environmental effects, environmental indicators, environmental impact assessment methodology, modeling, monitoring, and national growth. (Author summary modified)

62459 **APTIC NO. 79702**

McGlennon, John A. S.

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS; VERMONT. PROPOSED REGULATORY AND MONITORING CHANGES. *Federal Register, 40(181):42895-42896, Sept. 17, 1975.*

Proposed revisions were submitted to be included in the Vermont Implementation Plan for attainment of National Air Quality Standards. They include a definition of public notice and a revision of the sampling method for photochemical oxidants. The Combustion Limitation for Fuel Burning Equipment which rated heat input over 1000 million Btu/hr would be revised from 0.02 lb/hr/10 to the 6th power Btu to 0.06 lb/hr/10 to the 6th power Btu of particulates. The proposed Winooski site would be deleted from the originally proposed Air Quality Network. The Air Board rule pertaining to oral hearings would be revised.

62460 **APTIC NO. 79705**

Meyers, Sheldon

ENVIRONMENTAL IMPACT STATEMENTS AND OTHER ACTIONS IMPACTING THE ENVIRONMENT. *Federal Register, 40(191):45224-45227, Oct. 1, 1975.*

Federal agency actions impacting the environment and reviewed and commented upon in writing by the Environmental Protection Agency during the period August 16, 1975 to August 31, 1975 are listed in a series of appendices. Appendix I contains a list of draft environmental impact statements reviewed and commented upon in writing during the review period. Appendix II contains the definitions of the classifications of EPA s comments on the draft environmental impact statements. Appendix III contains a list of the final environmental impact statements reviewed and commented upon in writing. Appendix IV contains a list of final environmental impact statements reviewed but not commented upon by the EPA. Appendix V contains a list of proposed Federal agency regulations, legislation proposed by Federal agencies, and any other proposed actions reviewed and commented upon in writing pursuant to section 309(a) of the Clean Air Act. Appendix VI contains a listing of the names and addresses of the sources of EPA reviews and comments.

62461 **APTIC NO. 79731**

Meyers, Sheldon

ENVIRONMENTAL IMPACT STATEMENTS AND OTHER ACTIONS IMPACTING THE ENVIRONMENT. AVAILABILITY AGENCY COMMENTS. *Federal Register, 40(182):42052-42056, Sept. 18, 1975.*

The availability of Environmental Protection Agency comments on Federal agency actions impacting the environment contained in the following appendices during the period of July 1961 to July 31, 1975 is announced. Appendix I contains a listing of draft environmental impact statements. Appendix II contains the definitions of the classifications of EPA s comments on the draft environmental impact statements. Appendix III contains a listing of final environmental impact statements. Appendix IV contains a listing of final environmental statements reviewed, but not commented upon. Appendix V contains a listing of proposed Federal agency regulations, legislation proposed by Federal agencies, and other proposed actions. Appendix VI contains a listing of the names and addresses of the sources of EPA reviews and comments.

62462 **APTIC NO. 79900**

Midurski, Theodore P., Alan H. Castaline, Robert M. Patterson, and Arnold J. Soolman

IDENTIFICATION AND EVALUATION OF LOCALIZED VIOLATIONS OF CARBON MONOXIDE STANDARDS. VOLUME I: GUIDELINES (DRAFT FINAL REPORT). *GCA Corp., Bedford, Mass., GCA/Technology Div., Environmental Protection Agency Contract 68-02-1376 and 68-02-1337, Task Order 6, Rept. GCA-TR-75-36-G(1), 210p., Nov. 1975. 23 refs.*

Guidelines are presented for the identification and analysis of locations with the potential for experiencing violations of the National Ambient Air Quality Standard for carbon monoxide, and for planning corrective measures. Screening guidelines are provided to determine the potential hot spots, where CO standards might be violated, along highways. Modeling guidelines aid in the selection of suitable air quality models for more extensive evaluation of the potential CO hot spots found by screening, and for evaluation of alternative corrective measures. Planning guidelines described available traffic engineering techniques for controlling CO levels, and recommend an overall planning process for CO hot spot control. Data collection procedures and computation techniques are discussed. (Author abstract modified)

62463 **APTIC NO. 76348**

Mikami, Tatsuo

SUMMARY OF THE WORKING ENVIRONMENT DETERMINATION METHOD. *(Sagyo kankyo sokuteiho no aramashi). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 13(3):47-56, Aug. 1975.*

Japan Law 28 (May 1, 1975), which, under the Ministry of Labor, established further working environment monitoring regulations, and set up licensing procedures for working environment monitors, is discussed. Licensed monitors are to inspect working conditions in 5 specified work areas: four indoor work areas containing mineral dust, unenclosed radiation materials, lead, and organic solvents; and a work area containing specified chemicals. Licensed monitors are divided into two grades. Grade 1 monitors can do all design, sampling, and analytical work in the monitoring of working conditions. Grade 2 monitors are more limited in their activities. Monitors are licensed through the Ministry of Labor, and must meet standards of ethics as well as pass proficiency tests. A knowledge of occupational health regulations is necessary. Agencies for working environment monitoring are to be established under the Ministry of Labor, or regional occupational standard authorities, to provide standardized inspections and monitoring of occupational environments when the individual enterprises are unable to provide self-monitoring.

62464 **APTIC NO. 76138**

Missen, Robert and Arnold Stein

GUIDELINES FOR EVALUATION OF VISIBLE EMISSIONS. CERTIFICATION, FIELD PROCEDURES, LEGAL ASPECTS, AND BACKGROUND MATERIAL. *Pacific Environmental Services, Inc., Santa Monica, Calif., Environmental Protection Agency Contract 68-02-1390, Task 2, Rept. EPA-340/1-75-007, 132p., April 1975. 162 refs.*

NTIS: PB 247675/AS

Guidelines for assisting Environmental Protection Agency personnel in evaluating visible emissions from stationary sources are presented. The guidelines include: field procedures for evaluating visible emissions from both non-stack emission sources and specific stack emission sources, the effects of different operating variables and viewing conditions on opacity readings, training and certification procedures for visible emissions evaluations, and the legal aspects of opacity observations, including a summary of court cases. (Author abstract modified)

62465 **APTIC NO. 79646**

Mohry, Herbert, Angela Lehmann, and Dieter Kahl

DETERMINATION OF IMMISSION CONCENTRATIONS IN THE NEIGHBORHOOD OF LARGE EMITTERS BY MEASUREMENTS AND CALCULATION AS EVALUATION BASIS FOR TERRITORIAL PLANNING. *(Messtechnische und rechnerische Ermittlungen von Immissionskonzentrationen im Einflussbereich von Grossemittenten als Bewertungsgrundlage fuer die Territorialplanung). Text in German. Energietechnik, 25(3):93-100, 1975. 6 refs.*

The general procedure of ground-level concentration measurements of gaseous and particulate air pollutants, information processing, and model calculation as the basis of territorial planning in East Germany is outlined. As required by the new Clean Air Maintenance Act, air pollution monitorings are carried out by different institutions and industrial plants to determine the compliance with the hygienic standards, and to substantiate emission control measures and territorial planning in general. This information is centrally processed by the Meterological Service which has meteorological data for the entire territory of the country. Newly developed uniform mathematical models of the dispersion and dilution processes permit the computation of predictons on the air pollutant levels in industrial areas as a function of structural changes. Constant concentration fields are assumed to occur in large industrial areas with a great number of emission sources. The good agreement between analytical and calculated concentration values indicates the applicability of mathematical modeling as a basis for territorial planning.

62466 **APTIC NO. 83820**

Montgomery, Robert E., Jr.

FEDERAL ENERGY ADMINISTRATION. ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION. NOTICE OF INTENTION TO ISSUE PROHIBITION ORDERS TO CERTAIN POWER PLANTS. *Federal Register, 40(96):21516-21534, May 16, 1975.*

The Federal Energy Administration announces an intention to issue prohibition orders to certain power plants. The order prohibits specific generating stations of the Potomac Electric Power Co., Virginia Electric Power Co., Baltimore Gas and Electric Co., and Delmarva Power and Light Co. from burning natural gas or petroleum products as their primary energy source. On the basis of the environmental analyses conducted by the Federal Energy Administration, the analyses of air quality impacts which the Environmental Protection Agency is required to conduct prior to effectiveness of a prohibition order, as well as the necessity for the power plants to comply with the Clean Air Act and other applicable environmental protection requirements, Federal Energy Administration proposes to find the prohibition order is consistent with the purpose of the Energy Supply and Environmental Coordination Act of 1974 to provide a means to meet the nation s essential fuel needs in a manner which is consistent to the fullest extent practicable, with existing national commitments to protect and improve the environment.

62467 **APTIC NO. 83887**

Montgomery, Robert E., Jr.

FEDERAL ENERGY ADMINISTRATION. ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT. INTENTION TO ISSUE PROHIBITION ORDERS TO CERTAIN POWERPLANTS. *Federal Register, 40(99):22171-22176, May 21, 1975.*

The Federal Energy Administration announces an intention to issue prohibition orders to certain power plants. The order prohibit specified plants to Wisconsin Public Service Corp. and Detroit Edison Co. from burning natural gas or petroleum products as their primary energy source. The order is not effective until the Environmental Protection Agency allows the plant to burn coal and comply with all applicable air pollution requirements.

62468 **APTIC NO. 84026**

Montgomery, Robert E., Jr.

FEDERAL ENERGY ADMINISTRATION. PROHIBITION ORDERS. INTENTION TO ISSUE TO CERTAIN POWER PLANTS. *Federal Register, 40(100):22305-22309, May 22, 1975.*

The Federal Energy Administration announces an intention to issue prohibition orders to certain power plants. The order prohibits a specific generating station of the Public Service Co. of New Hampshire from burning natural gas or petroleum products as their primary energy source. On the basis of the environmental analyses conducted by the Federal Energy Administration, the analyses of air quality impacts which the Environmental Protection Agency is required to conduct prior to effectiveness of a prohibition order, as well as the necessity for the power plants to comply with the Clean Air Act and other applicable environmental protection requirements, the Federal Energy Administration proposes to find the prohibition order is consistent with the purpose of the Energy Supply and Environmental Coordination Act of 1974 to provide for a means to meet the nation s essential fuel needs in a manner which is consistent to the fullest extent practicable, with existing national commitments to protect and improve the environment.

62469 **APTIC NO. 80138**

Morris, A. R.

DISTRICT OF COLUMBIA: PROPOSED REVISION TO IMPLEMENTATION PLAN. *Federal Register, 40(172):40855, Sept. 4, 1975.*

The District of Columbia submitted an amendment to its Implementation Plan, consisting of a 14.87 mile bikelane project. The bikelanes are located in various parts of the District and are of varied design. The District has also requested that the bikelane program be considered a replacement to the pilot bikelane project for Pennsylvania Avenue, contending that the route might lead to traffic, safety, and funding problems and the design criteria set forth by the Environmental Protection Agency are too stringent.

62470 **APTIC NO. 83068**

Morris, A. R.

DISTRICT OF COLUMBIA. PROPOSED REVISION TO IMPLEMENTATION PLAN. *Federal Register, 40(227):54436, Nov. 24, 1975.*

The District of Columbia submitted a proposal requesting that amendments to the District s Air Quality Control Regulations be approved as revisions to the District of Columbia Implementation Plan for the attainment and maintenance of the National Ambient Air Quality Standards. One amendment requires that Solid Waste Reduction Center Number 1 be operated so as not to discharge into the atmosphere particulate matter in excess of 0.8 grains/standard dry cu ft of exhaust gas corrected to 12% carbon dioxide. The other amendment would allow for the continued operation of Solid Waste Reduction Center Number 1 beyond May 31, 1975. The District of Columbia states that operation of the waste reduction center with particulate emissions of less than 0.08 grains/standard cu ft will not preclude the city from attaining and maintaining the National Ambient Air Quality Standard for suspended particulates. The District of Columbia also sees no evidence that continued operation of the waste reduction center would endanger the health of the District s residents. The District claims that closing the waste reduction center without a realistic alternative could precipitate a crisis, creating health problems and an additional cost burden. A public hearing was held to consider public comment on the proposed revision.

62471 **APTIC NO. 81837**

Morrison, David L.

ENVIRONMENTAL STRESSOR MATRIX SYSTEM FOR EARLY WARNING. *In: Seminar on Early Warning Systems for Toxic Substances, Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Environmental Protection Agency Rept. EPA-560/1-75-003, p. 175-195, July 1975. 8 refs.*

The concept of an environmental stressor matrix is applied to an early warning system for air pollutants and other environmental hazards. One of the objectives of the environmental stressor matrix is to trace an agent from its several sources along all of its environmental pathways through various receptors to determine its effect on man. The environmental stressor matrix arrays stressors against sources, transport paths, and effects classifications. The matrix effectively connects the early warning concepts embodied in surveillance of commercial trends with toxicological responses. The applicability of the environmental stressor matrix concept is illustrated for lead and the pesticide dichlorodiphenyltrichloroethane (DDT).

62472 **APTIC NO. 76447**

Murphy, R. P.

MOTOR VEHICLE EMISSION LEGISLATION IN NEW SOUTH WALES. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 262-280. 12 refs. (Feb. 17-21.)*

The development of legislation for the control of motor vehicle exhaust emissions in New South Wales, Australia is reviewed. Topics covered include: the New South Wales Clean Air Act, the Motor Traffic Act, and the Clean Air Amendment Bill; emission standards for smoke, carbon monoxide, hydrocarbons, and nitrogen oxides; motor vehicle design rules; fuel lead content standards; and enforcement procedures. In addition to emission and fuel regulations, procedures are also included in present legislation for establishing regulations dealing with the operation, inspection, and testing of motor vehicles.

62473 **APTIC NO. 83027**

Nehman, Gerald I., John M. Griffin, and Kenneth M. Duke

LAND USE IN ENVIRONMENTAL PLANNING. *Res. Outlook, 7(1):21-25, 1975.*

The role of land use in environmental planning is discussed, with particular emphasis on employing the Land Use Trade-Off Model (LUTOM). The model evaluates all locations that are identified as feasible from a policy perspective. The evaluation includes an analysis of the land s suitability for development from an economic, social, and environmental standpoint and an analysis of the compatibility of the proposed land use with existing land use patterns. Typical criteria employed for the environmental suitability analysis include: air quality, water quality, soil erosion, biological productivity of the land and water habitats, physical displacement of plant and animal communities, and esthetics. All land areas are assigned to the most appropriate types of planning resource units, e.g., marsh, swamp, flood plain, forest, to carry out the LUTOM suitability analysis. A map overlay is then made up to show the boundaries of all of the resource units, and this overlay serves as a graphic data bank to be used in conjunction with existing and proposed land use map configurations. Planners can use environmental-suitability matrices to screen development proposals.

62474 **APTIC NO. 82876**

Nitsche, W.

ENVIRONMENTAL PROBLEMS WITH SPECIAL REGARD TO TECHNICAL-HYGIENIC ENVIRONMENTAL PROTECTION. *(Umweltprobleme unter besoderer Beruecksichtigung des technisch-hygienischen Umweltschutzes). Text in German. Z. Allgemeinmed., 51(14):647-677, May 20, 1975. 103 refs.*

Reports are presented on the increasing environmental pollution as it affects not only the soil and forests, but also clean air and water, solid waste disposal, noise control, and food preservation. Some definitions are discussed as well as the problems of sources of pollutant materials; disorders and risks to human beings caused by current conditions; and possible measures to control these pollutants. Legislation was studied concerning maximum allowable concentrations for individual materials, which are hardly ever exceeded in the German Federal Republic.

62475 **APTIC NO. 76082**

Oglesby, S. and E. R. Hendrickson

FIELD SURVEILLANCE AND ENFORCEMENT GUIDE: WOOD PULPING INDUSTRY (FINAL REPORT). *Environmental Science and Engineering, Inc., Gainesville, Fla., Environmental Protection Agency Contract 68-02-0618, Rept. EPA-450/3-75-027, 275p., March 1975. 82 refs.*

NTIS: PB 246753/AS

Guidelines and background information for use by personnel of state and local air pollution control agencies engaged in surveillance and enforcement activities related to major types of chemical pulp mills are presented. The guidelines cover three major types of mills: kraft, sulfite, and neutral sulfite semichemical. Each type of mill is discussed in terms of process description, gaseous and particulate emissions characterization, monitoring processes, air pollution control systems, field enforcement equipment, and reporting and enforcement procedures.

62476 **APTIC NO. 80056**

Okada, S.

COMMUNICATION OF PHOTOCHEMICAL SMOG ALARM BY LOCAL SELF-GOVERNING BODIES WITH PARTICIPATION OF THE INHABITANTS IN THE WARDS. *(Chiho jichitai to kumin sanka ni yoru smog-keiho no dentatsu). Text in Japanese. Tokyo-to Yakuzaishikai Shi (J. Tokyo Met. Assoc. Pharm.), no. 118:40-41, July 1975.*

Although the number of patients who officially complain of photochemical smog damage is gradually decreasing (28,223 in 1971, 8437 in 1972, 4035 in 1973, and 2711 in 1974), systems of photochemical smog alert are still urgently needed. In the ward of Bunkyo in Tokyo, a system of alarm-communication has been established by the Association of Pharmacists. The decision of the Environmental Pollution Control Agency of the ward to call an alert is phoned to the Association, which delivers the alarm to each drug store by telephone. Each store hoists a yellow flag announcing the alert and gives advice to customers and passersby.

62477 **APTIC NO. 79985**

Oride, K. and A. Yoshino

AIR POLLUTION ALERT SYSTEM. *(Doji Tsuho sojushin shistem). Text in Japanese. Nippon Denki Giho (Tech. Rept. Nippon Electr. Co., Ltd.), no. 2:52-59, March 1975.*

Under the air pollution control law, the governor must inform the residents about air pollution conditions and order the pollution source to cease or decrease the emission of pollutants when pollution exceeds a certain level. For the sake of communications between the control center, pollution monitoring stations, the pollution sources, and the residents, air pollution alert systems have been installed in most areas where air pollution has been expected. The NEC has been engaged in the design and installation of this communications system, including the computorized monitoring stations and central control station.

62478 **APTIC NO. 79730**

Oswald, Robert L.

NATIONAL ENVIRONMENTAL POLICY ACT OF 1969. GUIDELINES FOR IMPLEMENTATION. *Federal Register, 40(166):37233-37238, Aug. 26, 1975.*

Guidelines for implementation of the National Environmental Policy Act of 1969 are announced. The guidelines consist of general provisions including purpose and scope, authority, policy, interpretations, waivers or exemptions; definitions; identification of major Federal actions significantly affecting the quality of the human environment, actions with a potential effect on the environment, actions where no environmental issues are present; environmental procedures including reporting requirements, preparation of environmental threshold assessment surveys, preparation of environmental impact statements, public meetings in preparation of environmental impact statements, minimum periods for review; final determinations including hearings procedure, initial and final decisions; and miscellaneous provisions including official notice, cost of material distributed to the public and billing of applicants.

62479 **APTIC NO. 83429**

Paley, Louis R.

DEGREE OF INTEREST AND RESPONSIBILITY OF ALL PARTIES IN ACQUIRING REPRESENTATIVE EMISSION TEST RESULTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 2 refs. (Presented at the Air Pollution Control Association Specialty Conference - Air Pollution Measurement Accuracy as It Relates to Regulation Compliance, New Orleans, La., Oct. 27, 1975.)*

The sharing of responsibility for acquiring representative emission test results by the source, test team, equipment manufacturer, and regulatory agencies is discussed. The major user of the results bears the greatest portion of the ultimate responsibility for obtaining sufficiently representative results, particularly when that user is the equipment manufacturer or regulatory agency. The test team (both in-house and consultant) plays a unique role by acting as the focal point and coordinator of the interaction between the parties in sharing the responsibilities of assisting the other parties in determining what level of overall representativeness is required to achieve the primary purpose of the test program and to assist them in implementing the necessary actions to achieve this level of data quality. (Author summary modified)

62480 **APTIC NO. 76595**

Panagiotakopoulos, Demetrios

A MULTI-OBJECTIVE FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT USING GOAL PROGRAMMING. *J. Environ. Syst., 5(2):133-147, 1975. 6 refs.*

A prescriptive framework for environmental management at the regional level is presented which allows for a sufficiently realistic representation of the total system, deals systematically with multiple objectives through goal programming optimization techniques, and suggests an effective interaction between the decision maker and the analyst for devising compromises among conflicting objectives. This is designed as an improvement over the ad hoc trial and error analysis based on tradeoff relations. The procedure is directed toward establishing the economic growth/environmental quality possibility frontier of a region. (Author abstract modified)

62481 **APTIC NO. 80249**

Persson, Goran A.

THE SWEDISH APPROACH TO AIR POLLUTION CONTROL. *Preprint, The National Swedish Environment Protection Board, 19p., 1975. (Presented at the International Clean Air Conference, Rotorua, New Zealand, Feb. 17-21, 1975.)*

Sweden itself is briefly described. The agency mainly responsible for environmental policy implementation under the Ministry of Agriculture is the National Environment Protection Board. Its technical department has two industry divisions, a municipal division, a supervision unit and a permit unit. A special responsibility of the County Administrations is the supervision of stationary sources. Air pollution at the local level is mainly dealt with by the Health Boards. Both the air resource management approach and the best practical means approach are used. Subsidies of up to 75% of the costs were allocated for pollution control measures in industry, for work commenced between November 1st, 1971, and June 30, 1972. Emissions are monitored from a representative number of vehicles already in use. If a group of vehicles with excessive emissions is identified, more complete durability tests may be required for certification of new models or the certificate may be withdrawn. Pollution control in the energy field is also discussed.

62482 **APTIC NO. 83387**

Pianko, Marc

METHODOLOGY OF AIRCRAFT NUISANCE CERTIFICATION. *(Methodologie de la certification des nuisances des avions). Text in French. Aeronaut. Astronaut., no. 53:21-32, p. 75, 1975.*

A study of aircraft nuisances should be based on acceptability by the neighborhood, aircraft usefulness, and best technological effort. The establishment of specifications should include aircraft classification, nuisance description, and choice of limit levels. The distribution and concentration of the various pollutants emitted from airplane engines (carbon monoxide, nitric oxide, nitrogen dioxide, and various hydrocarbons) will largely depend on the atmospheric conditions at the airport. The nuisance of each pollutant will be considered separately. For each pollutant, the noxiousness of the aircraft will be quantified by the total mass of the gas emitted during aircraft operations within close proximity of the ground. To determine a procedure for the measurement of the pollutant, a reference motor regimen and a reference duration must be determined and associated with movement on the ground (before take-off and after landing), acceleration on the airway, take-off, and landing. To control pollution, regulations and limits must be defined for each type of plane.

62483 **APTIC NO. 83988**

Poehls, Herbert

CLEAN AIR MAINTENANCE AND NOISE CONTROL PROBLEMS IN COUNTRYWIDE TRAFFIC PLANNING. *(Luftreinhaltung und Laermbekaempfung - Probleme in der staatlichen Verkehrsplanung). Text in German. VDI (Ver. Deut. Ingr.) Z., 117(15/16:713, Aug. 1975.*

The environmental problems generated by automobile traffic, such as air pollution and noise, should be abated by an efficient traffic planning, which should be an integrated part of city planning. A systems analytical model of clean air maintenance and noise abatement versus traffic is presented. The increased cost of maintaining a private automobile has failed to put an end to the further increase in the number and use of automobiles in West Germany.

62484 **APTIC NO. 76291**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS: REVISION TO THE NEW YORK STATE IMPLEMENTATION PLAN. *Federal Register, 40(179):42542-42543, Sept. 15, 1975.*

A New York State regulation provides for the preconstruction review of indirect sources. The sources affected are parking facilities, airports, and highways. There are separate regulations for urban and nonurban areas. It must be shown that an affected facility would not contribute to violation of applicable national ambient air quality standards. The applicable standards for a parking facility are those for carbon monoxide. The standards applicable to highway sections and airports are those for CO, photochemical oxidants, and nitrogen dioxide.

62485 **APTIC NO. 76596**

Quarles, John

PART 52 -- APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. APPROVAL OF REVISION TO OREGON IMPLEMENTATION PLAN. *Federal Register, 40(153):33215-33216, Aug. 7, 1975.*

A revision to Oregon's State Implementation Plan (SIP) dealing with Kraft pulp mills was approved. The amended regulation sets specific emission limitations for total reduced sulfur (TRS) in addition to particulate matter and sulfur dioxide. Because TRS is not a pollutant for which a national ambient air quality standard has been established, that portion of the regulation relating to TRS is not an official portion of the SIP. Consequently that portion of the submission is not enforceable by the Environmental Protection Agency. The revised regulation sets specific emission limitations for particulate matter from recovery furnaces, lime kilns, and smelt dissolving tanks. It also sets a specific emission limitation for sulfur dioxide from recovery furnaces. Federal schedules for bringing Kraft pulp mills in Oregon into compliance with the Oregon Kraft pulp mill emission limitations were revoked, because they are no longer necessary. An error was corrected in the compliance schedules for sulfite pulp mills for Oregon.

62486 **APTIC NO. 76597**

Quarles, John

PART 52 -- APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. IDAHO: APPROVAL OF REVISIONS. *Federal Register, 40(153):33215, Aug. 7, 1975.*

Revisions to the Idaho State Implementation plan for national ambient air quality standards were approved. The revisions consist of amendments to the regulations on ambient air quality standards and general provisions. The revisions to the general provisions add several definitions and require the reporting of any exceeded emission limits resulting from the shutdown of any air pollution control equipment for scheduled maintenance while the related equipment continues in operation. Permission of the State Department of Health and Welfare must be obtained prior to such a shutdown and permission may be granted only if a maximum reasonable effort has been made to complete such maintenance during periods of nonoperation of the related equipment. The regulation on ambient air quality standards was amended to maintain consistency with Environmental Protection Agency standards for sulfur oxides. The maximum 3-hour secondary standard under the amended regulation is 1300 microgram/cu m.

62487 **APTIC NO. 76611**

Quarles, John

PART V: REQUIREMENTS FOR SUBMITTAL OF IMPLEMENTATION PLANS. STANDARDS FOR NEW STATIONARY SOURCES. EMISSION MONITORING. *Federal Register, 40(194):46250-46271, Oct. 6, 1975.*

Regulations are promulgated requiring continuous monitoring of emissions from certain stationary sources. They include changes made as the result of comments received on the proposed regulations. The background of the regulations is discussed. The purpose of the regulations is to establish minimum performance specifications for continuous monitoring systems, minimum data reduction requirements, operating procedures, and reporting requirements for the affected facilities. Fuel analysis provisions for fossil fuel fired steam generators were reserved in the promulgated regulations. Proposed procedures for data conversion for nitric acid plants were retained due to the small benefit from additional monitoring equipment. New data conversion procedures were developed for sulfuric acid plants; the appropriate conversion factor is computed by analyzing the sulfur dioxide concentration entering the converter. Requirements for continuous monitoring systems for firebox temperature and oxygen are deleted for petroleum refineries, and the section specifying the excess emissions for capacity that must be reported has been reserved. Several changes were made in the performance specifications.

62488 **APTIC NO. 79673**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. GEORGIA: APPROVAL OF PLAN REVISIONS. *Federal Register, 40(193):45818, Oct. 3, 1975.*

Revisions to the Georgia State Implementation Plan are approved by the Environmental Protection Agency Administrator. The revisions deal with sulfur dioxide limitations which are more stringent than those prescribed by the state's regulations. In particular, a sulfur content maximum is placed on the fuel oil burned by the Georgia Power Company's Plant Atkinson. Other revisions relate to the deletion of Georgia air pollution control regulations which set particulate emission limits on certain sources which vary according to stack height.

62489 **APTIC NO. 79676**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. PROPOSED REVISION TO THE VIRGIN ISLANDS AIR QUALITY CONTROL IMPLEMENTATION PLAN. *Federal Register, 40(191):45202-45203, Oct. 1, 1975.*

Proposed revisions to the Virgin Islands Implementation Plan are presented. The revisions deal with exempting the St. John Municipal Incinerator from certain requirements of the Virgin Islands Air Pollution Control Code on the basis that earlier projections of ambient sulfur dioxide and particulate contributions from the facility overpredicted the actual conditions. Copies of the proposed revisions are available for public inspection.

62490 **APTIC NO. 79678**

Quarles, John

WISCONSIN AIR IMPLEMENTATION PLAN. PROPOSED DISAPPROVAL OF NEW SOURCE REVIEW PROVISIONS. *Federal Register, 40(190):44848-44849, Sept. 30, 1975.*

The Environmental Protection Agency proposes to disapprove the New Source Review Provisions of the Wisconsin State Implementation Plan. The disapproval is based on the fact that Wisconsin statutes permit construction of new sources or modifications to them if the state agency fails to issue a prohibition order regardless of whether or not such construction or modification interferes with the attainment and maintenance of the National Ambient Air Quality Standards. In addition, the Wisconsin plan fails to meet the public comment requirements. Thus, unless the state acts to correct these deficiencies by submitting a revision to the plan, the EPA is proposing a disapproval and is substituting proposed regulations to correct the deficiencies.

62491 **APTIC NO. 79703**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. NORTH CAROLINA: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 40(175):41779-41787, Sept. 9, 1975.*

A list of compliance schedules for the North Carolina State Implementation Plan which are hereby approved by the Environmental Protection Agency Administrator is presented. All of the schedules establish dates by which individual air pollution sources must attain compliance with the emission limitations of the State Implementation Plan. In many cases the schedules include incremental steps toward compliance, with specific dates set for achieving those steps. Copies of the schedules and the North Carolina plan are available for public inspection.

62492 **APTIC NO. 79706**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. REVISION TO THE VIRGIN ISLANDS IMPLEMENTATION PLAN. *Federal Register, 40(176):42012-42013, Sept. 1975.*

Approval and disapproval actions by the Environmental Protection Agency regarding revisions to the Virgin Islands Implementation Plan dealing with preconstruction review of new or modified stationary sources and indirect sources are set forth. Section 206-30 (Review of new sources and modification) of the revised implementation plan does not meet EPA requirements and is only approvable in part. This section also does not meet the public comment analysis requirements. Section 206-31 which requires the preconstruction review of indirect sources of air pollution is approved.

62493 **APTIC NO. 79738**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. IOWA: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 40(154):33452-33453, Aug. 8, 1975.*

The approval of revised compliance schedules for the state of Iowa is announced. Each approved revision establishes a new date by which the individual source must comply with the applicable emission limitation in the federally approved State implementation plan. All schedules include incremental steps toward compliance with the applicable emission limitations. To the extent that the schedules extend past the variance expiration date, they are not legally enforceable at this time. The approval of each compliance schedule is unconditional only as to that part of the schedule covered by the initial variance. Approval of the remainder of the schedule is conditioned upon the state s renewal of the variance in identical form and substance to that included in the schedule submitted to the Environmental Protection Agency.

62494 **APTIC NO. 80033**

Quarles, John

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. INDIANA--APPROVAL OF PLAN REVISIONS. *Federal Register, 40(208):50032-50033, Oct. 28, 1975.*

The approval of revisions to the implementation plan of the state of Indiana is announced. Action is finalized on APC-3, APC-16, APC-17, AOC-18, AOC-20, and APC-22, isofar as they classify counties for purposes of controlling total suspended particulates, carbon monoxide, and nitrogen oxides. New APC-3 introduces a 15-minute exemption period in each 24-hour period. New APC-16 effectively removes all existing stationary sources of carbon dioxide from the applicable control strategy. New APC-17 effectively removes all stationary sources of nitrogen dioxide from the applicable control strategy. Regulation APC-18 represents a series of compliance schedules affecting the various sources of particulate matter. Regulation APC-20 concerns the control of fugitive dust emissions.

62495 **APTIC NO. 80038**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. REVISION TO THE NEW YORK STATE IMPLEMENTATION PLAN. *Federal Register, 40(211):50718, Oct. 31, 1975.*

A revision to the New York state implementation plan is announced. The revision contains an estimate of additional reductions to be achieved in hydrocarbon emissions from process sources due to solvent reformation and control; a recalculation of automobile emissions based on an assumption of a greater amount of travel in new vehicle than that which was assumed in the original plan using national driving characteristics; and a proposal to delete the inspection and maintenance of light duty vehicles as an element of the control strategy.

62496 **APTIC NO. 80046**

Quarles, John

COMMONWEALTH OF PUERTO RICO. APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. *Federal Register, 40(177):42211-42212, Sept. 11, 1975.*

An amendment was proposed to the Puerto Rico Regulation for the Control of Atmospheric Pollution, which revises the control strategy for sulfur oxides by assigning a maximum allowable sulfur content, by weight, to each source having a rated heat input capacity which is greater than 8 million British thermal units/hr. The sulfur contents are chosen such that the resulting ambient air quality concentrations predicted by means of a specified dispersion model are below the national ambient air quality standards for sulfur oxides. The Central Guanica and Pfizer plants in Ensenada and Barceloneta were initially modeled without the impact of terrain. The predicted sulfur dioxide concentrations for these areas after terrain was included showed that with the assigned fuel sulfur limitations, contravention of the maximum 24-hour and annual average national standards for sulfur oxides would result. To correct the deficiencies of these sources, maximum fuel sulfur limitations of 0.4% and 0.5%, by weight, for the Central Guanica plant and Pfizer unit 15, respectively, are proposed. The text of the amendment proposed to this effect is included.

62497 **APTIC NO. 80119**

Quarles, John

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES.

EMISSION REGULATIONS FOR NEW MOTORCYCLES. *Federal Register, 40(205):49495-49530, Oct. 22, 1975.*

Emission regulations for new motorcycles are proposed. A displacement dependent hydrocarbon phase-in standard is proposed with emission levels proportional to engine displacement. The levels proposed for the 1976 through 1978 model years are: 5 g/km for hydrocarbons, 17 g/km for carbon monoxide, and 1.2 g/km for oxides of nitrogen. The 1980 and subsequent model years emissions standards proposed are 0.25 g/km for hydrocarbons, 2.1 g/km for carbon monoxide, and 0.25 g/km for oxides of nitrogen. A crankcase emission standard is proposed with certification based on engineering analysis rather than system testing. Public comment is invited.

62498 **APTIC NO. 80120**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. FLORIDA: APPROVAL OF PLAN REVISIONS. *Federal Register, 40(205):49328, Oct. 22, 1975.*

The approval of revisions to the Implementation Plan for the state of Florida is announced. The changes affect limits on sulfur dioxide emissions from existing sulfur recovery plants and sulfuric acid plants. Existing plants are subject to an immediately effective limit of 0.08 lbs of SO2/lb of S recovered. This corresponds to a recovery efficiency of 96%. The emission limit for H2SO4 plants in the Florida portion of the Jacksonville, Florida-Brunswick, Georgia Interstate Air Quality Control Region is relaxed to 29 lb SO2/ton 100% H2SO4.

62499 **APTIC NO. 80136**

Quarles, John

PART 52 -- APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. APPROVAL OF REVISION TO THE PHILADELPHIA PORTION OF THE PENNSYLVANIA IMPLEMENTATION PLAN. *Federal Register, 40(175):41787-41788, Sept. 9, 1975.*

Revisions to several regulations in the Philadelphia portion of the Pennsylvania State Implementation Plan were approved. The revisions added detailed requirements for registration of emission sources and reporting of emissions. The new regulations on Control of Emissions for Incinerators ban new refuse incinerators and lower the allowable particulate emission limit in accordance with Federal standards. The Environmental Protection Agency had previously informed Pennsylvania that the amendment pertaining to complex sources was unacceptable, so it was withdrawn from consideration.

62500 **APTIC NO. 80161**

Quarles, John

PART 52 -- APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. PREVENTION OF SIGNIFICANT AIR QUALITY DETERIORATION. *Federal Register, 40(176):42011-42012, Sept. 10, 1975.*

Ferroalloy production facilities commencing construction after October 5, 1975 are added to the list of sources subject to preconstruction review. The criteria intended for use in adding further sources are described: the establishment of a new source performance standard for sulfur dioxide or particulates for the source or any facility of the source that will allow any anticipated future plant affected by the standard to emit SO2 or particulate matter in excess of 25 lb/hr. Only those new plants which will exceed the 25 lb/hr emission limitation will be required to undergo the preconstruction review. Several minor corrections are made to amendments to the significant deterioration regulations.

62501 **APTIC NO. 80481**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. RHODE ISLAND REVISION. *Federal Register, 40(212):51043-51044, Nov. 3, 1975.*

The approval and promulgation of a revision to the Rhode Island Implementation Plan is announced. The revision includes Regulation 10, Air Pollution Episodes, and allows the concentration of sulfur dioxide to reach 500 microgram/cu m before the alert level is declared and 800 microgram/cu m before the warning level is declared. The regulation meets the requirements of the Clean Air Act and 40 Code of Federal Regulations Part 51.

62502 **APTIC NO. 82865**

Quarles, John

CONTROL OF AIR POLLULTION FROM NEW MOTOR VEHICLES AND ENGINES. PART 85 -- CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. SUBPARTS I AND J. PART 86 -- CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES: CERTIFICATION AND TEST PROCEDURES. *Federal Register, 40(126):27574-27635, June 30, 1975.*

The regulations are listed as amended in 1975. Subpart I of Part 85 includes smoke emission standards for 1974 and later model year diesel heavy duty engines; testing procedures, including the smoke measurement system; and the types of information which must be provided for certification of conformity to the regulations. Subpart J of part 85 includes gaseous emission standards and testing procedures for the same engines. Part 86 includes similar information for 1977 model year light duty vehicles, light duty trucks, gasoline-fueled heavy duty engines, and diesel heavy duty engines and 1978 light duty trucks.

62503 **APTIC NO. 83907**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. SULFUR OXIDES CONTROL STRATEGY, MONTANA. *Federal Register, 40(201):48521-48525, Oct. 16, 1975.*

Regulations are reproposed for the control of sulfur dioxide at a copper smelter located near Anaconda, Montana, for changing the date for attainment of the primary national ambient air quality standard (NAAQS), and to establish a date for attainment of the secondary NAAQS. No final action was taken on the previous sulfur oxides proposed regulations because litigation between the Anaconda Company and the Environmental Protection Agency (EPA) delayed further action. The state air quality data upon which the previously proposed regulations were based were not considered in the present proposed regulations, because of serious questions concerning them. To obtain more comprehensive ambient sulfur dioxide air quality data, EPA established a three station monitoring network in the vicinity of the smelter to augment the existing state operated monitoring network. Data from the three stations are summarized in tabular form. The emission limitations contained in the proposal are based upon values predicted by an atmospheric dispersion model. The proposed regulation would require Anaconda to continue to operate and maintain the present hooding system on the converters and to capture fugitive emissions from the matte and slag transfer points and vent such captured emissions to a stack serving the facility.

62504 **APTIC NO. 83939**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. IDAHO: APPROVAL OF REVISION. *Federal Register, 40(213):51195-51196, Nov. 4, 1975.*

The approval of revisions to the Idaho State Implementation Plan is announced. The revision pertains to regulation T, which established a State procedure for issuing air pollution Source Permits. The Regulation states that the permits provide, where appropriate, an interim schedule of compliance for those sources which may not be in compliance with applicable regulations at the time of issuance. The revision adds the requirement that the State must conduct one or more public hearings prior to the submission to the Administrator of any compliance schedule or revision to a compliance schedule.

62505 **APTIC NO. 84170**

Quarles, John

SULFUR OXIDES CONTROL STRATEGY -- IDAHO: APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. *Federal Register, 40(162):36385-36388, Aug. 20, 1975.*

The Environmental Protection Agency evaluated a sulfur dioxide control proposal for a sulfuric acid plant and found Idaho regulations inadequate. When notified, the state indicated that EPA should promulgate a new emission control regulation and compliance schedule. An hourly maximum atmospheric diffusion model and air quality concentration ratios were used in the evaluation. It is proposed that the promulgated compliance schedule for sulfuric acid plants be rescinded as it applies to The J. R. Simplot Company, owners of the plant evaluated. The attainment date for the primary standards for sulfur oxides in the Eastern Idaho Intrastate Region would be extended to March 31, 1976. Use of best engineering techniques would be required, emissions and stack locations would be regulated, and continuous measurement would be required. The new provisions would not apply to the same company's Minerals and Chemical Division located in Power County, Idaho.

62506 **APTIC NO. 84307**

Quarles, John

REQUIREMENTS FOR THE PREPARATION, ADOPTION AND SUBMITTAL OF IMPLEMENTATION PLANS. EMISSION MONITORING OF STATIONARY SOURCES. *Federal Register, 40(194):46240-46349, Oct. 6, 1975. 2 refs.*

Revisions to the regulation controlling emission monitoring of stationary sources is announced. Continuous emission monitors are not required for sources unless such sources are subject to an applicable emission limitation of an approved State Implementation Plan. Nitrogen oxide emission monitors are required only where specified. Continuous monitoring of oxygen is not required unless the continuous monitoring of sulfur dioxide and/or nitrogen oxides emissions is required.

62507 **APTIC NO. 84309**

Quarles, John

STAGE II GASOLINE VAPOR RECOVERY. PROPOSED DECISION, AMENDMENTS, AND TEST PROCEDURE. *Federal Register, 40(197):47668-47685, Oct. 9, 1975. 19 refs.*

The proposed Stage II gasoline vapor recovery amendments and test procedure for eight air quality control regions (AQCR) are announced. The range of uncontrolled emissions within the affected AQCRs is 3-16%. Two thirds of these emissions are attributable to terminal operations and filling of storage tanks (Stage I) at service stations, while the balance of the uncontrolled emissions emanated from the fueling of automobiles (Stage II). The proposed amendments require that large facilities, which account for 56% of the gasoline pumped, and certain new or modified facilities meet an emission limitation of 0.4 g/gal of gasoline dispensed. A more lenient standard is set for smaller stations and exempt facilities with very small volumes of gasoline pumped. The spillage restrictions are relaxed.

62508 **APTIC NO. 80137**

Ravan, Jack E.

ALABAMA: APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. *Federal Register, 40(172):40854-40855, Sept. 4, 1975.*

Alabama proposes changes in its sulfuric acid plant regulations. The current regulations are included. The present limits on acid mist and sulfur trioxide emissions would remain for plants in operation on January 18, 1972, which is when the original regulations were adopted. The limit on sulfur dioxide emissions would be relaxed to 27 lb/ton of 100% H2SO4 produced. Sources now emitting less than 27 lb SO2/ton 100% H2SO4 would not be allowed to increase emissions of this pollutant. New sulfuric acid plants would be required to meet SO2 and acid mist emission limits equivalent to those specified in the New Source Performance Standards for this category of sources: 4 lb SO2 and 0.15 lb H2SO4 mist/ton of 100% acid produced. Finally, all sulfuric acid plants would be required to continuously monitor SO2 emissions.

62509 **APTIC NO. 79674**

Ravan, Jack E.

FLORIDA. APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS: PROPOSED PLAN REVISIONS. *Federal Register, 40(159), 1p., Aug. 15, 1975.*

Proposed revisions to the Florida State Implementation Plan involving changes in the limits for sulfur dioxide emissions from fossil-fuel-fired steam generating plants are presented. The revisions are designed to change the limits for burning liquid fuels by such sources from 1.1 lb of SO2/million Btu input to 2.75 lb SO2/million Btu for plants with a heat input exceeding 250 million Btu/hr. Lower limits are proposed for certain selected plants and regions. The proposed new limit for plants burning solid fuel is 6.17 lb SO2/million Btu heat input instead of the previous limit of 1.5 lb SO2/million Btu input. Certain exceptions to this limit involving lower limits are proposed for selected plants and regions throughout the state. All of the new emission limits are to be reevaluated in a public hearing before July 1, 1977.

62510 **APTIC NO. 76015**

Record, F., R. M. Patterson, M. T. Mills, E. P. V. Ward, D. A. Bryant, and R. C. Galkiewicz

PHOTOCHEMICAL OXIDANT MODELING. VOLUME II - DETAILED TECHNICAL REPORT (FINAL REPORT). *GCA Corp., Bedford, Mass., GCA/Technology Div., Office of Air and Waste Management Contract 68-02-1376, Task 14, Rept. EPA-450/3-75-069-b, 149p., April 1975. 53 refs.*

NTIS: PB 246208/AS

An analysis of activities designed to support the Environmental Protection Agency goal of developing technical and policy guidelines for assessing the oxidant air quality impact of highway development is presented. Topics covered include: a review of techniques and computer models for estimating mobile source emissions, a brief summary of oxidant and nitrogen oxide formation processes, a discussion of oxidant modeling activities involving the Diffusion/Kinetics Code (DIFKIN) and Gifford-Hanna photochemical models, and a test run of the indirect source review and 109(j) guidelines. (Author abstract modified)

62511 **APTIC NO. 76014**

Record, F. A., R. M. Patterson, D. A. Bryant, and A. H. Castaline

PHOTOCHEMICAL OXIDANT MODELING. VOLUME I - TECHNIQUES APPLICABLE TO HIGHWAY SYSTEM EVALUATION (FINAL REPORT). *GCA Corp., Bedford, Mass., GCA/Technology Div., Office of Air and Waste Management Contract 68-02-1376, Task 14, Rept. EPA-450/3-75-069-a, GCA-TR- 75-11-G(1a), 107p., July 1975. 44 refs.*

NTIS: PB 245915/AS

A comparative evaluation of modeling techniques for assessing the photochemical oxidant air quality impact of highway system modification or development is presented. An analysis of five attributes of eight modeling techniques is performed.

The modeling techniques considered are: Vehicle-Miles of Travel (VMT) Change, Linear Rollback, Nonlinear Rollback, the Gifford-Hanna Photochemical Model, Statistical Relationships: Repro-Modeling, the Reactive Environmental Simulation Model, the Diffusion Kinetics Model, and the Urban Air Shed Photochemical Simulation Model. The following five attributes are discussed for each of these models: applicability and reliability, data and manpower requirements, use of the technique, limitations of the technique, and special features of the model. Guidelines for choosing a model best suited to a given need based on compatibility with these attributes are presented. (Author abstract modified)

62512 **APTIC NO. 79624**

Reynolds, Steven D. and John H. Seinfeld

INTERIM EVALUATION OF STRATEGIES FOR MEETING AMBIENT AIR QUALITY STANDARD FOR PHOTOCHEMICAL OXIDANT. *Environ. Sci. Technol., 9(5):433-447, May 1975. 34 refs.*

Two strategies proposed for meeting ambient air quality standards for photochemical oxidant in the South Coast Air Basin of California are evaluated: the 1977 Environmental Protection Agency Transportation Control Plan and the current federal light-duty vehicle exhaust emission standards. Currently available means of relating emissions to air quality for photochemical smog are employed in the evaluation. The methods used include modified rollback based on ambient data and laboratory data, the statistical model of Trijonis, and the physicochemical model of Reynolds. An appendix is given containing a detailed emission inventory projection for Los Angeles in 1977. (Author abstract)

62513 **APTIC NO. 80296**

Richard, C.

HOW TO MAINTAIN CLEAN AIR OVER THE PACIFIC ISLANDS. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 50-65. 8 refs. (Feb. 17-21.)*

Recommendations for maintaining clean air over the Pacific Islands are presented. Present industrial sources of air pollutants include: nickel ore smelting works, oil refineries, mineral processing and mining operations, and municipal incinerators. A growing number of motor vehicles on the Islands adds to the potential for air pollution problems. A monitoring network consisting of analyzers for the detection of sulfur dioxide, nitric oxide, nitrogen dioxide, oxidants, carbon monoxide, hydrocarbons, and particulates is suggested in addition to equipment for measuring meteorological variables. Planning and zoning procedures are suggested for future industrial sitings. Transportation controls to minimize exhaust emissions and to encourage alternate modes of transportation are also recommended.

62514 **APTIC NO. 84061**

Ritschel, Otto

DIRECTION AND PLANNING OF ENVIRONMENTAL PROTECTION IN THE MINING AND METALLURGICAL COMBINE ALBERT FUNK, FREIBERG. *(Leitung und Planung des Umweltschutzes im VEB Bergbau- und Huettenkombinat Albert Funk, Freiberg). Text in German. Neue Huette, 20(12):748-752, Dec. 1975.*

The East German metallurgical combine Albert Funk has begun participating in the effort to control environmental pollution. Four steps are given with orientation to a series of necessary measures, new technology, recovery techniques, investments, organizational support, and monitoring programs. An important condition for proper management of environmental protection programs is the establishing of duties and responsibilities with structural organization. Management would entail the participation of personnel in decision making and finding solutions. Processing of plans is based on legal stipulations and industrial specifications. An extensive system has been developed for internal control in ten East German plants.

62515 **APTIC NO. 83440**

Rose, Thomas Hadley, Jerry W. Burger, and Doyle T. Brittain

THE MONITORING AND FIELD SUPPORT ACTIVITY OF THE NATIONAL AIR SURVEILLANCE NETWORK. STANDARD OPERATING PROCEDURES FOR EPA REGION IV. *Environmental Protection Agency, Surveillance and Analysis Div. Retion IV, 112p., Aug. 5, 1975.*

Standard operating procedures for the National Air Surveillance Network, Environmental Protection Agency Region IV are presented. Topics covered include: high volume and gas bubbler sampling procedures, equipment selection, calibration methods, data handling procedures, calculations and technical diagrams, and mailing procedures. Tabulations are provided for NASN site locations and sampling schedules. The purpose of the standard operating procedures is to enable a high school graduate to have a two day general familiarization session and then use the document to operate the NASN.

62516 **APTIC NO. 79612**

Royston, Michael G. and Joseph C. Perkowski

DETERMINATION OF THE PRIORTIES OF ACTORS IN THE FRAMEWORK OF ENVIRONMNETAL MANAGEMENT. *Environ. Conserv., 2(2):137-144, Summer 1975. 20 refs.*

One major source of uncertainty in industrial planning is due to the conflicting uses of environmental components by the proponent of an action and the various actors who share the proponent s environment. These actors may be government agencies, health authorities, conservation organizations, or individual citizens. As they all share the environment with the proponent of the action, they should also share decision making. Difficulties in identifying nongovernmental potential actors can be reduced by undertaking a rigorous analysis of the environmental components, of the uses which they serve, of the way in which the uses may be impaired by proposed activities, and hence of which users are most likely to be concerned. The result of such an approach, which constitutes a new style of management from the outside in rather than from the inside out, is that industry must involve itself in a broader-based and more imaginative planning process than hitherto. Failure by industry to do this will result in either a progressive erosion of the freedom of decision making by increased government interference or in progressive blocking of industry s plans and consequently a reduction in its ability to achieve its corporate objectives in the face of conflict over its operations, its siting proposals, and its products. (Author abstract modified)

62517 **APTIC NO. 79986**

Saito, Hideji, Akihiro Shiozawa, and Rikio Hamaoka

RADIOCOMMUNICATION SYSTEM FOR MULTIPLE DESTINATION. *(Doho musen shisutem). Text in Japanese. Nippon Denki Giho (Tech. Rept. Nippon Electr. Co., Ltd.), no. 2:60-64, March 1975. 1 ref.*

A prompt warning of pollution conditions is needed to avoid injury from photochemical smog, especially in schools. The government of Tokyo planned to install a radiocommunication system in all schools, from kindergarten to university. Since the first installation in August 1972, 2500 receiver stations have been in operation in schools in Tokyo, and this plan will be extended to other schools. The design and construction of the system has been carried out by the NEC. The system consists of a control center, a broadcast station (400 MHz band), and a receiver station (the school).

62518 **APTIC NO. 79987**

Sakayori, Michio

ELECTRIC SIGN BOARD SYSTEM FOR AIR POLLUTION. (Gaito denko hyoji shisutem). Text in Japanese. Nippon Denki Giho (Tech. Rept. Nippon Electr. Co., Ltd.), no. 2:65-72, March 1975. 3 refs.

An electric sign board, which indicated information about local air pollution, is described. These sign boards are peripheral stations of the entire air pollution control system, which consists of a control center and a number of observatory monitoring stations. The NEC has been engaged in the design and installation of complete systems in Tokyo, Yokohama, Kawaguchi, Chiba city, and Okayama Prefecture. The sign board indicates the concentration of sulfurous gas, oxidants, nitrogen oxides, and carbon monoxide, as well as noise level, and gives warning of photochemical smog. The technology of the system is reviewed.

62519 **APTIC NO. 84169**

Sampson, Arthur F.

CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT. POLICIES AND PROCEDURES FOR IMPLEMENTATION. *Federal Register, 40(162): 36339-36342, Aug. 20, 1975.*

An amendment is added to the Federal Procurement Regulations, prescribing policies and procedures for implementing the Clean Air Act. The amendment prescribes solicitation provisions and an appropriate contract clause. Small purchases are exempt with the approval of the Environmental Protection Agency. Work required by a contract may not be performed in a facility listed on the Environmental Protection Agency List of Violating Facilities. The contractor must also comply with the requirements of the Clean Air Act relating to inspection, monitoring, entry, reports, and information. Revisions of procurement forms for construction and architect-engineer contracts and leases for real property are included. Compliance with the Federal Water Pollution Control Act is also required.

62520 **APTIC NO. 76172**

Sanchez, David and John Silvasi

GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS, VOLUME 13: ALLOCATING PROJECTED EMISSIONS TO SUBCOUNTY AREAS; SUPPLEMENT NO. 1 (FINAL REPORT). *Office of Air and Waste Management Research Triangle Park, N. C., Office of Air Quality Planning and Standards, Rept. EPA-450/4-74-014-b, 42p., Oct. 1975.*

NTIS: PB 247777/AS

A hypothetical example illustrating how consideration of the Federal New Source Performance Standards should be incorporated in the emission estimates needed to conduct subcounty allocation procedures is presented. The example uses three existing industrial sources of emissions to demonstrate how different effective dates for the NSPS affect the projection of emissions. A list of estimated NSPS and the approximate dates by which they are expected to take effect is provided for industrial emissions of suspended particulates, sulfur oxides, nitrogen oxides, carbon monoxide, and hydrocarbons.

62521 **APTIC NO. 83909**

Schmitt, Alfred

TECHNICAL MEASURES FOR THE CONSERVATION OF CLEAN AIR. *(Technische Massnahmen zur Luftreinhaltung). Text in German. In: Fundamentals of Air Conservation and Noise Abatement in North Rhine Westfalia, p. 62-69, 1975.*

Technical measures for the conservation of clean air applied to industry, domestic heating, handicrafts, and vehicular traffic are discussed. They extend to plants emitting coarse dust and sulfur dioxide, by limiting dust emission to 150 mg/cu m, prescribing lower sulfur content in fuel and raw materials, and erecting higher chimney stacks. Ordinances to control air pollution caused by small trade and households were enacted. Technological devices to limit SO2 emission to 3.75 kg/hr/mW in coal-powered electrical plants are discussed. Dust and CO emissions are held to 150 mg/cu m and 250 mg/cu m, respectively. The same regulations are in force for power plants usimng heavy fuel oil. In the chemical industry, and purification of flue and waste gases has been introduced to limit emissions of organic and inorganic gases and health-endangering fine dusts of lead, zinc, cadmium, arsenic, nickel, and cobalt. In the crude oil industry with its emission of hydrocarbons, organic compounds, and SO2, sealed floating roof tanks or respirable solid roof tanks, sealed drainage or suction installations, safety vents, restrictions of S2 content in fuel oil to 1 wt%, and supervision of all SO2 and hydrocarbon sources by automatic registration were employed. In the steel industry, the goal is total dust elimination from steel mills starting with eletric-furnace steel. In garbage incineration with a chlorine content, presently at about 4.5 kg/t, at least 80% purification is technologically possible. Combustion of substances involving the risk of forming highly toxic oxidation or decomposition products (chlorinated hydrocarbons. polychlorinated biphenyls) is strictly forbidden. In the non- ferrous metal industry, emission limits are set at 20 mg/N cu m for lead, cadmium, and chromium, 50 mg/N cu m for zinc, and 75 mg/N cu m for copper. In cement production, emission limits were recently reduced to 120 mg/cu m, in some cases 75 mg/cu m. In domestic oil-heating households, the number of complaints was reduced by 52% over a period of 10 yr by enforcing ordinances lowering emissions of dust, soot, unsaturated hydrocarbons, foul-smelling sulfur, and reaction products. A similar success was accomplished with solid fuel central-heating and individual furnaces. In the small trades, new emission limitation rulings require afterburning, adsorption, and other waste gas purification methods. Gasoline lead content has been lowered to 0.4 g/l as of 1971, and 0.15 g/l in 1976.

62522 **APTIC NO. 83004**

Schulze, Richard H.

EVALUATION OF INDUSTRIAL SOURCES USING DISPERSION MODELING. *Preprint, Air Pollution Control Assoc. Pittsburgh, Pa., South Section, 10p., 1975. 10 refs. (Presented at the Air Pollution Control Association Southern Section Annual Meeting, 6th, Sept. 18, 1975.)*

Two relatively recent regulations of the Environmental Protection Agency suggest that an increasing amount of dispersion modeling will be done in the future. The first requires the states to designate Air Quality Maintenance Areas (AQMAs). The state agencies are required to develop methods to insure that future growth of both stationary and mobile sources will not result in air quality worse than ambient air standards. The second regulation deals with significant deterioration. It will generally apply outside of AQMAs and is aimed at limiting the deterioration of ambient air quality due to industrial development. It obliges the states to establish three categories of air cleanliness and to assess the ambient air impact of facilities prior to issusing construction permits. Modeling will be used in complying with both regulations. Ambient air modeling reports for industrial plants and smaller power plants are often divided into five sections. The section on calculation of emissions defines the parameters for each stack. The emission rate for pollutions can be determined by either measurement or calculation. Each stack is analyzed to determine the combinations of wind speed and stability that produce the highest ground level concentrations. The effect of combining all stacks is then assessed and the combination of wind speed, wind direction, and stability that produces the highest ground level concentration is found. The peak 15-minute calculated concentrations determined in this section are then multiplied by the time averaging factors. The highest calculated concentrations usually occur under meteorological conditions that occur infrequently. Calculation of annual average pollutant concentrations is also discussed. The most critical standards, however, are those for time averaging periods between 1 and 24 hr.

62523 **APTIC NO. 83017**

Sedman, Charles B.

CONSIDERATIONS FOR FEDERAL AIR REGULATIONS FOR COAL GASIFICATION PLANTS. *Preprint, American Inst. of Chemical Engineers, New York, 12p., 1975. (Presented at the American Institute of Chemical Engineers National Meeting, 80th, Boston, Mass., Sept. 7-10, 1975.)*

Information is being gathered for possible developement of standards of performance for atmospheric emissions from coal gasification plants. Early regulation would minimize development of new pollution problems and avoid problems of nonuniform state and local regulation, while providing early direction to the industry in handling emission problems. Initial regulations will be based on anticipated sulfur and hydrocarbon emissions from Lurgi-based coal gasification plants. These regulations will consider several control options and compare emission reduction, control costs, and energy and environment impact. Problems encountered in developing standards for coal gasification plants are identified and discussed. (Author abstract modified)

62524 **APTIC NO. 84615**

Shigeta, Yoshihiro

HOW TO CONTROL THE ODOR TROUBLES IN EACH LOCAL DISTRICT? *(Chiiki betsu akushu kisei no ichikosatsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):639, 1975. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 374.)*

Proposed future control of odor pollution in relation to people is discussed. Each community would calculate the total odor emission rate in their particular area. According to that calculated odor emission rate, individual sources of odor such as kraft pulp mills, factories, animal farms, waste treatment facilities, and petrochemical factories would be assigned an acceptable emission rate. Also it would be necessary to determine the odors compositions and their levels which can be accepted by the people in that area. This would be done by a group of representatives from the community, industrial factories, and professional odor control technicians. If the actual odor level is much higher than the proposed acceptable level of odor, than there is still too much odor pollution. If this gap can be narrowed with a long range projection for odor control, the odor pollution problem can be solved. If it cannot be done within the scope of economic or technical feasibility, the odor pollution will still remain as a public nuisance.

62525 **APTIC NO. 82278**

Shimanuki, Mitsujiro and Minoru Yoshida

ATMOSPHERIC POLLUTION CONTROL IN IWAKI CITY. PRESENT SITUATION AND PROBLEMS. *(Iwaki-shi no taiki osen taisaku. Sono genjo to mondaiten). Text in Japanese. Koshu Eisei (Public Health), vol. 39:609-613, Sept. 1975. 11 refs.*

Industrial pollution problems of regions around Iwaki City (Onahama Harbor) are discussed. Industrial development began in 1964; pollution control regulations were promulgated in 1970. Fukushima Prefecture and Iwaki City established a joint pollution control center in January 1972. Telemetric monitoring and warning systems are in effect. Photochemical smog and inversion layer monitoring have been undertaken. Standards have been established for toxic substances unique to Fukushima Prefecture (zinc and copper and their compounds; hydrogen cyanide; hydrogen phosphide). Standards stricter than national standards have been established for cadmium and its compounds, chlorine, hydrogen chloride, fluorine, hydrogen fluoride, silicon fluoride, and lead and its compounds. In 1975, Fukushima Prefecture concluded an agreement with 9 enterprises in the Iwaki region, for reduction of emissions of sulfur oxides, from the present hourly level of 2318 cu m to 989 cu m by the end of 1978.

62526 **APTIC NO. 80134**

Shimono, S.

PRESENT SITUATION AND TRENDS OF NITROGEN OXIDES CONTROL. *(Chisso sankabutsu kisei no genjo to hoko). Text in Japanese. Otomeshon (Automation), 20(9):9-12, Sept. 1975.*

The focus of air pollution control problems has shifted from particulates and sulfur oxides to nitrogen oxides. The present status and future trends of the NOx control law are reviewed. The NOx emission standard issued in 1968 and problems involved in NOx control are discussed. The air quality standard and the necessity for strict emission standards for stationary and mobile NOx sources are reviewed. The feasibility of achieving an environmental standard of 0.01 ppm (yearly average) by means of total emissions quantity control and emission standards is discussed with calculations of the necessary reduction rate of NOx emission in five and eight year periods. A description of total emission quantity controls as defined by the Air Pollution Control Law and the procedure for calculation of total permissible emissions, and problems involved in the enforcement of total emissions control are also discussed.

62527 **APTIC NO. 76085**

Siegel, Richard D., Peter H. Guldberg, Kenneth W. Wiltsee, Jr., and Ralph B. D. Agostino

IMPACT OF ENERGY SHORTAGE ON AMBIENT SULFUR DIOXIDE AND PARTICULATE LEVELS IN METROPOLITAN BOSTON AQCR (FINAL REPORT). *Abcor, Inc., Cambridge, Mass., Walden Research Div., Office of Air and Waste Management Contract 68-02-1830, Program Element 2AC129, Rept. EPA-450/3-75-068, C-597, 212p., July 1975. 35 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 68th, Los Angeles, Calif., Nov. 1975 and at the AMS 4th Conference on Probability and Statistics in Atmospheric Science, Tallahassee, Fla., Nov. 1975.)*

NTIS: PB 246592/AS

A combination of statistical analysis of ambient air monitoring data and simulation analysis based on diffusion modeling was used to examine the effects of the energy shortage on sulfur dioxide and total suspended particulate levels throughout the Metropolitan Boston Air Quality Control Region. The modeling analysis revealed that the energy shortage was responsible for average concentration levels lower than those projected to occur if historical fuel use trends had continued during the winter of 1973-1974 due to the fact that conservation measures were more pronounced than the opposing effect resulting from the implementation of variances. Energy-shortage-related parameters were responsible for an estimated 18% decrease in SO_2 levels and a 2% decrease in total suspended particulates between the first quarter of 1973 and the first quarter of 1974. (Author conclusions modified)

62528 **APTIC NO. 80023**

Siler, O. W.

COAST GUARD. ENVIRONMENTAL IMPACTS. PROCEDURES FOR CONSIDERATION. *Federal Register, 40(205):49383-49397, Oct. 22, 1975.*

Guidelines for the preparation and processing of environmental impact statements and related documents to insure consideration of the environmental effects resulting from major Coast Guard actions are proposed. The statement must reflect sufficient analysis to predict the effects of the proposed action on attainment and maintenance of any applicable environmental standards established by law or administrative determination including comments or determinations of the offices charged with administration of the State s implementation plan for air quality as to the consistency of the project with State plans for the implementation of ambient air quality standards. The Federal agencies and Federal-state agencies with jurisdiction by law or special expertise to comment upon air quality are listed and include the Environmental Protection Agency.

62529 **APTIC NO. 82567**

Simmons, William

VAPOR RECOVERY CONTROL IN SAN DIEGO COUNTY. *Preprint, San Diego County Air Pollution Control District, Calif., 14p., 1975. 4 refs. (Presented at the North American Motor Vehicle Emissions Control Conference, Annual, 4th, Anaheim, Calif., Nov. 5, 1975.)*

The initiation and development of a vapor recovery control program in San Diego County is described. On January 17, 1972, San Diego County adopted new rules for the storage and transfer of gasoline in an effort to reduce the amount of hydrocarbon vapors escaping during gasoline filling operations. Rules were established requiring that hydrocarbon vapors be passed through a control system which is capable of recovering at least 90% of the vapors on a continuous basis. Controversy currently exists between the County and major oil companies concerning which type of vapor recovery system is suitable. The oil companies favor a vapor balance system, whereas the County is insisting on vacuum-assist systems. No oil company or major equipment manufacturer has developed a vacuum-assist system to meet the market need to date. Vacuum-assist systems are currently being tested by the County s Air Pollution Control District, and one system has received safety certification by nationally recognized testing laboratories. A cost-effectiveness breakdown is given for balance versus vacuum-assist vapor recovery systems.

62530 **APTIC NO. 83816**

Smith, Clifford, Jr.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. PROPOSED REVISION TO IDAHO IMPLEMENTATION PLAN. *Federal Register, 40(215):51655-51656, Nov. 6, 1975.*

A revision to the Idaho Implementation Plan is proposed. The revision is a consent order for Beker Industries Corp. The Department of Health and Welfare can shut down the plant if the tail gas absorption unit on the new sulfuric acid plant emits more than 6/lb sulfur dioxide/ton of 100% sulfuric acid produced. The combined allowable SO2 emissions from the existing and new sulfuric acid plants cannot exceed 27,000 lb SO2/any consecutive 24-hour period. Provisions are made for reporting monitoring data and control equipment.

62531 **APTIC NO. 80337**

Smith, Clifford V.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. REVISION TO WASHINGTON IMPLEMENTATION PLAN. *Federal Register, 40(149): 32347, Aug. 1, 1975.*

A revision to the State of Washington Air Quality Implementation Plan was submitted which repeals the program of review for construction of complex sources. The state s action was prompted in part by uncertainties about the future of the indirect source program nationally. If the repeal of the State of Washington s complex source review is approved, it will be necessary for the Environmental Protection Agency to repromulgate the federal indirect source regulation which is incorporated into the implementation plans of those states not submitting state regulations. Because the federal regulation has been suspended indefinitely, the repromulgation would have no practical effect until the federal regulation is reinstated.

62532 **APTIC NO. 80021**

Snyder, Daniel J., III

COMMONWEALTH OF PENNSYLVANIA. PROPOSED REVISION TO STATE IMPLEMENTATION PLAN. *Federal Register, 40(197):47521, Oct. 9, 1975.*

A proposed revision to the state implementation plan for the Commonwealth of Pennsylvania is proposed. The revision consists of an amendment to Chapter 123 with the addition of section 123.24, controlling emissions from primary zinc smelters. The concentration of sulfur oxides (sulfur dioxide) in the effluent gas from any zinc roasting operation cannot exceed 500 ppm by volume (dry basis) calculated as a 2-hour moving average. A formula was devised for calculating permissible sulfur oxide emissions from zinc sintering operation. Other amendments are also listed. Public comment is invited.

62533 **APTIC NO. 83937**

Snyder, Daniel J., III

MARYLAND STATE IMPLEMENTATION PLAN. PROPOSED REVISION. *Federal Register, 40(194):46117, Oct. 6, 1975.*

Revisions to the State of Maryland Implementation Plan are proposed. The revisions include: changes in the time period for renewal applications for operating permits from 90 days before expiration to 60 days before expiration; deletion of the regulation which controls particulate emissions from grain drying operations; changes in the regulation which allows sulfur content limitation of solid fuels burned on a premise to be specified at an emission limitation of 3.5 lb sulfur oxide emissions/million Btu of heat input; and changing the allowable sulfur content of residual fuel oil from 1.0% to 2.0%. A change is requested in the regulation which exempts the sale of fuel used for fuel burning installations on shops from the provisions pertaining to the burning of fuel of specified sulfur content and in the regulation which requires 90% control of all gasoline vapor emissions during filling of storage tanks.

62534 **APTIC NO. 80029**

Snyder, Robert E.

H2S NEW REGULATIONS FORCE UPDATE OF OLD PRACTICES. *World Oil, 181(6):57-65, Nov. 1975.*

The background of thee Texas Railroad Commission s April 17, 1975 Rule 36 affecting all sour drilling, producing, and transporting operations in the state is summarized. The regulation imposes stiff employee and public protective measures on every drilling, production, and fluid handling operation containing 100 ppm hydrogen sulfide, 0.01% by volume. Existing and potential problems are analyzed by type of field operations and geographical location. Some of the important specific technical data on equipment and field methods brought to light by industry s recent investigations are reviewed.

62535 **APTIC NO. 80209**

Stapleton, Carl Ralph

INTERDEPENDENCE AND COORDINATION WITHIN STATE ENVIRONMENTAL PROTECTION AGENCIES. *Michigan Univ., Ann Arbor, Dept. of Environmental Health Sciences, Thesis (Ph.D.), 1975, 230p. 56 refs.*

Hypotheses were formulated which stated statistically significant positive relationships between standardization and the coordination achieved between pooled interdependent state Environmental Protection Agency units (Hypothesis 1), planning and the coordination achieved between sequentially interdependent units (Hypothesis 2), and mutual adjustment and the coordination achieved between reciprocally interdependent units (Hypothesis 3). Data were obtained to test the hypotheses from the Illinois EPA and the Ohio EPA using interviews and questionnaires. Hypothesis 1 is fully supported by the data from both state EPAs; statistically significant positive correlations were obtained for the pooled activities. Nonpooled units produced positive nonsignificant results. Hypothesis 2 is also verified by the state EPA data. The results for Hypothesis 3 are not as distinct as those of Hypothesis 1 and 2. The correlations between nonreciprocal units and mutual adjustment proved different interdependency types and associated coordinative mechanisms are viable for state EPAs. All of the reciprocally interdependent units yielded positive correlations with mutual adjustment, but less than half of the correlations are statistically significant. Further analyses revealed interunit tension may be lowering the correlations between mutual adjustment and the coordination achieved between reciprocally interdependent units. Poor coordination might also be responsible for increased interunit tension. The implications of the findings are discussed. Coordination should be included as a design criterion for state EPAs. The EPA activities should be matched with interdependency types and coordinative mechanisms. Coordination should be monitored within EPAs by using selected indicators. Conflict resolution methods used in state EPAs can have significant impacts on interunit tension. (Author abstract modified)

62536 **APTIC NO. 83941**

Stephenson, Earl J.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. KANSAS: APPROVAL AND DISAPPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 40(95):21045-21046, May 15, 1975.*

The approval and disapproval of compliance schedules for the state of Kansas are proposed. The approved schedules are consistent with the approved control strategies of Kansas. Each approved revision establishes a new date by which the individual source must comply with the applicable emission limitation in the federally approved State Implementation Plan. The schedules proposed to be disapproved extend beyond the attainment date in the state Implementation Plan.

62537 **APTIC NO. 83944**

Strelow, Roger

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. CORRECTIONS. *Federal Register, 40(109):24186-24192, June 5, 1975.*

Additions to the amendments to the motor vehicle air pollution control regulations dealing with testing procedures for 1976 and subsequent model light duty vehicles and light duty trucks are issued. Test procedures are described for vehicles which are required to be tested for compliance with the exhaust and fuel evaporative emission standards. The exhaust emission test is designed to determine hydrocarbon, carbon monoxide, and oxides of nitrogen emissions while simulating an average trip in an urban area of 7.5 mi. The test consists of engine startups and vehicle operation on a chassis dynamometer through a specified driving schedule. The fuel evaporative emission test is designed to determine fuel hydrocarbon evaporative emissions to the atmosphere as a consequence of urban driving, and diurnal temperature fluctuations during parking. Activated carbon traps are used in collecting the vaporized fuel.

62538 **APTIC NO. 82805**

Suzuki, Tatsuzo and Noboru Ohsumi

STUDIES ON METHODOLOGY OF DATA ANALYSIS FOR POLLUTION PROBLEMS. (AIR POLLUTION DATA SAMPLING AND ANALYSIS). *(Kogai mondai ni okeru deta kaiseki no hohoron ni kansuru kenkyu. (Taiki osen deta no torikata to sono kaiseki)). Text in Japanese. Kankocho Kogai Senmo Shiryo (Public Nuisance Gaz.), 10(6):1-17, Nov. 1975. 2 refs.*

Instead of constructing simulation models from incompletely weighted and analyzed data, a Statistical Air-Quality Monitoring System (SAMS), based on the statistical nature of the raw data, was developed, to analyze the deluge air pollution data. Cluster and AID (Automatic Interaction Detection) analyses were used to treat the data. Patterns of pollutant level distributions were developed for Chiba City, Japan, and compared to patterns of pollution awareness of the residents of the areas, as determined by interview surveys. Persons living in high pollution areas (air pollution, noise, malodor, plant damage, dust) showed greater awareness of pollution, and were more positive in their answers. In areas with lower pollutant concentrations, answers were more vague when questions became more detailed.

62539 **APTIC NO. 79768**

Talley, Wilson K.

AMBIENT AIR MONITORING REFERENCE AND EQUIVALENT METHODS. NOTICE OF EQUIVALENT METHOD DESIGNATION. *Federal Register, 40(157):34024-34025, Aug. 13, 1975.*

The Environmental Protection Agency designated two manual methods for the measurement of ambient concentrations of sulfur dioxide as Equivalent Methods in accordance with 40 Code of Federal Regulations Part 53. The specific designated methods are these: ESQ-0775-001, pararosaniline method for the determination of sulfur dioxide in the atmosphere- Technicon I Automated Analysis System and ESQ-0775-002, pararosaniline method for the determination of sulfur dioxide in the atmosphere- Technicon II Automated Analysis System.

62540 **APTIC NO. 80144**

Thom, Gary C. and Wayne R. Ott

PROGRESS TOWARD A UNIFORM AIR POLLUTION INDEX. *J. Air Pollution Control Assoc., 25(11):1157-1158, Nov. 1975. 8 refs.*

The establishment of a uniform air pollution index is discussed. An extensive national survey of air pollution indices currently in use was conducted as a joint study of the Environmental Protection Agency and the President s Council on Environmental Quality. The study includes: a thorough review of the existing literature on air pollution indices, a telephone survey soliciting information from over 55 air pollution control agencies in North America, and a case study of a three state metropolitan area (Steubenville, Wheeling, Pittsburgh) where an attempt is currently being made to adopt a uniform tri-state air quality index. By developing an index classification system, it is possible to analyze and compare the various indices reported in the literature and those that are used by the agencies surveyed. A Federal Interagency Task Force on Air Quality Indicators was established to evaluate the feasibility of establishing a uniform air quality index. Four candidate index formats are under active consideration.

62541 **APTIC NO. 81836**

Thomas, Theodore James and James E. Flinn

REVIEW OF HEALTH/ENVIRONMENTAL SYSTEMS WITH POTENTIAL EARLY WARNING APPLICATIONS. *In: Seminar on Early Warning Systems for Toxic Substances, Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Environmental Protection Agency Rept. EPA-560/1- 75-003, p. 128-150, July 1975. 7 refs.*

An Environmental Protection Agency Office of Toxic Substances study of either existing or conceptual state-of-the-art systems that can be used or adapted to select, asses, and prioritize chemicals for their health or environmental effects is presented. Although numerous early warning systems exist, nearly all are formulated within a relatively narrow framework and are not readily adaptable to the needs of the EPA s Office of Toxic Substances. Most existing systems are based on the following approaches: the use of experts, a numerical index of measure or hazard, and subjective weighting factors or assigned values for selected parameters felt to be of importance. It appears possible to utilize the knowledge of existing early warning systems to conceptualize potential designs for a prioritization/classification scheme.

62542 **APTIC NO. 82613**

Tietenberg, Thomas and Albert J. Rosenthal

DEFINING THE STRATEGY OPTIONS. *In: The Automobile and the Regulation of its Impact on the Environment. Norman, Okla., Oklahoma Univ. Press, 1975, Chapt. 1, p. 13-30. 15 refs.*

Alternative strategies for controlling urban air pollution are reviewed, with particular emphasis on the control of automobile emissions. Topics covered include: control at the receptor site (e.g., air conditioning systems), control of environmental processes (e.g., meteorological modification), and control of the emissions source. Legal means that are considered for controlling urban air pollution include: emission and air quality standards, emission charges, and emission subsidies. Criteria for choosing among alternative strategies include: feasibility, efficiency, and equity

62543 **APTIC NO. 82461**

Toelg, Guenther

HOW QUALIFIED ARE ANALYTICAL INFORMATIONS IN ENVIRONMENTAL PROTECTION? *(Wie qualifiziert sind analytische Informationen im Umweltschutz)? Text in German. Erzmetall, 28(9):390-398, Sept. 1975. 12 refs.*

The quality and accuracy of chemical analysis as the basis of legislative measures concerning air pollution abatement are discussed. Analyses of identical samples for heavy metal contents by different laboratories gave well reproducible but sometimes greatly different results, which indicates that the analytical results may not truly reflect the actual contamination and pollution level. Moreover, it is not sufficient to evaluate the environmental hazards on the basis of overall pollutant balances since the toxicity and environmental relevancy of different elements is dependent on the actual form, i.e., chemical compound in which they occur. This was demonstrated for mercury whose accumulation in the soil due to natural and anthropogenic emissions does not correlate with its health hazards as most of the mercury is rapidly transformed into nontoxic compounds.

62544 **APTIC NO. 76539**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. REVISION TO OREGON IMPLEMENTATION PLAN. *Federal Register, 40(202):48680, Oct. 17, 1975.*

A revision to the Oregon implementation plan concerning civil penalties is approved. The Civil Penalties schedules provide specific penalties for certain violations. The revision regulation consolidates these to the three basic types. In addition to any liability, duty, or penalty provided by law, the appropriate authorities may assess a civil penalty for any violation pertaining to air quality by service of a written notice of assessment of civil penalty upon the respondent. Advance notice is not required where the pollution or contaminant source would not normally not be in existence for five days, or where the source might leave or be removed from the Oregon Department of Environmental Quality jurisdiction.

62545 **APTIC NO. 76609**

Train, Russell E.

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES. OPACITY PROVISIONS FOR FOSSIL FUEL-FIRED STEAM GENERATORS. *Federal Register, 40(176):42028-42029, Sept. 10, 1975.*

Steam generators are obligated to meet both the 20% emissions opacity limit based on 6-minute averages and the 40% limit based on 2-minute averages under current regulations. Since intermittent emissions due to soot blowing are not an operational problem for steam generators fired with gaseous or solid fossil fuels, the Environmental Protection Agency proposes deleting the 40% opacity, 2-minute average requirement for these facilities, and revising the requirements for reporting of continuous monitoring system opacity data. These revised requirements propose that all 6-minute averages in excess of 20% opacity be reported quarterly for gaseous, liquid, and solid fuel combustion, except that one 6-minute average/hr of 21 to 27% opacity need not be reported for liquid fuels.

62546 **APTIC NO. 76618**

Train, Russell E.

NEW STATIONARY SOURCES OF AIR POLLUTION. STANDARDS OF PERFORMANCE; OPACITY PROVISIONS: RESPONSE TO PUBLIC COMMENTS. *Federal Register, 40(175):41834-41835, Sept. 9, 1975.*

The Environmental Protection Agency has determined that no revisions should be made to 40 Code of Federal Regulations 60.11, Reference Method 9, or the opacity standard of performance for asphalt concrete plants. The most significant comments are discussed. Comments state that opacity observations are too inaccurate for enforcement of standards, 20% is not an appropriate standard, and the opacity standard has not previously been applied to fugitive emissions. The EPA believes that opacity observations according to Reference Method 9 are sufficiently accurate to be used to enforce opacity standards. The opacity standard should not be increased since the data support its feasibility. A performance standard applicable to a control device would be meaningless if significant quantities of emissions were allowed to bypass it. Comments on Reference Method 9 generally concern the possibility that observations made under nonideal conditions could result in an apparent violation, and the possibility of applying the method so as to deny due process of law. The method requires sufficient documentation of conditions to allow the court hearing the case to make an independent assessment as to the validity of the observation. The standard does not deny an alleged violator the opportunity to review the evidence against him. The amendments to the federal regulations are described. Most comments center around the propriety of allowing some sources to meet different standards than others, the administrative problems of implementing this procedure, and whether visual of instrumental opacity observations should be given precedence.

62547 **APTIC NO. 79729**

Train, Russell E.

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES: CERTIFICATION AND TEST PROCEDURES. TECHNICAL AMENDMENT. *Federal Register, 40(157):33973-33974, Aug. 13, 1975.*

A technical amendment is made to regulations for the control of air pollution from new motor vehicles and new motor vehicle engines and certification and text procedures. The change removes language specifying the minimum required lead and phosphorus content in unleaded fuels used for mileage accumulation. Minimum amounts of Pb and P were originally specified for unleaded fuel used for mileage accumulation to assure that such fuel would be representative of unleaded fuels expected to be commercially available. Now that unleaded gasoline is generally available, it is unnecessary to specify minimum amounts of Pb and P for that purpose.

62548 **APTIC NO. 79736**

Train, Russell E.

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. VIRGINIA. *APPROVAL OF COMPLIANCE SCHEDULES. Federal Register, 40(154):33450- 33453, Aug. 8, 1975.*

The approval of revised compliance schedules for the state of Virginia is announced. Each revision establishes a date by which an individual air pollution source must attain compliance with an emission limitation specified by the state implementation plan. Most schedules include incremental steps toward compliance with interim dates for achieving those steps.

62549 **APTIC NO. 80020**

Train, Russell E.

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS: ARIZONA. PROPOSED SULFUR OXIDE CONTROL STRATEGY AND REGULATIONS FOR EXISTING NON-FERROUS SMELTERS. *Federal Register, 40(205): 49362-49372, Oct. 22, 1975.*

Substitute regulations for control of sulfur oxide emissions at existing copper smelters in the Phoenix-Tucson Intrastate Region and the Arizona portion of the Arizona-New Mexico Southern Border Interstate Region are proposed. The regulations require the control of low level fugitive emissions identify specific points of control, and set a compliance schedule for achieving control of fugitive emissions. Two emission limits are established as achievable with reasonable available constant control. These emission limits are a sulfur dioxide concentration limit on acid plant emissions and a mass emission limit for the entire smelter. The emission limit for the acid plant is 2600 ppm for a single contact and 650 ppm for a double contact acid plant. All converter gas must be processed by the acid plant. A total plant emission limitation is specified based on the existing smelter configuration. Public comment is invited.

62550 **APTIC NO. 80099**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. SUBPART SS-TEXAS. SHIP AND BARGE VAPOR RECOVERY. SUSPENSION OF COMPLIANCE DATE. *Federal Register, 40(198):47765, Oct. 10, 1975.*

The compliance date for a final regulation requiring recovery of vapors emitted during loading and unloading of gasoline and other volatile compounds from ships and barges in the Houston-Galveston Intrastate Air Quality Control region is suspended. The final compliance date is suspended pending proposal and final publication of amendments. This action does not relieve those subject to the regulation from the obligation to continue to make maximum good faith efforts to comply with the substantive portions of the regulation. This suspension is in effect until March 1, 1976, or until final publication of amendments to the regulation, whichever is earlier.

62551 **APTIC NO. 80172**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. NEBRASKA: APPROVAL OF PLAN REVISIONS. *Federal Register, 40(175): 41778-41779, Sept. 9, 1975.*

The approval of plan revisions for the state of Nebraska implementation plans is announced. The state procedures for preconstruction review of new sources are expanded to include a determination of compliance with all State emission standards for stationary sources, to include indirect sources, and to provide a public comment period in the review process. A new provision provides that a construction permit will not be issued if the proposed source emits 1 ton/hr or more of particulate matter or sulfur dioxide if it is located within 20 mi of another source which emits 1 ton/hr or more of the same pollutant. A new sulfur oxides emission standard has been added for fuel-burning equipment. A final date for compliance has been added to the list of incremental dates required for a compliance schedule.

62552 **APTIC NO. 83069**

Train, Russell E.

PART 52 -- APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. KENTUCKY; CATEGORICAL COMPLIANCE SCHEDULES. *Federal Register, 40(170):40158-40160, Sept. 2, 1975. 1 ref.*

A categorical compliance schedule was proposed for indirect heat exchangers in Kentucky, to remedy a deficiency in the Kentucky implementation plan for ambient air quality standards. Written comments on the proposed compliance schedule were received, and statements regarding the schedule were heard at a public hearing. The comments referred to the short time provided for compliance, the type of hearing, the use of alternate control strategy, and the availability of low-sulfur fuels. Many facilities affected by the categorical regulation have concluded that its provisions specifically preclude the use of any control techniques except the use of low sulfur fuel or flue gas desulfurization. The Commonwealth of Kentucky and sources affected by the proposal are encouraged to continue the development of individual compliance schedules. These individually negotiated compliance plans may include any control technique which can be shown to satisfy the requirements of Kentucky air pollution control regulations. If such schedules are approved, the sources involved will automatically be exempt from the categorical compliance schedule. The categorical compliance schedule itself is included. This proposed schedule is promulgated effective October 2, 1975.

62553 **APTIC NO. 83811**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. APPROVAL OF REVISION TO OREGON IMPLEMENTATION PLAN. *Federal Register, 40(109):24184-24185, June 5, 1975.*

The approval of revisions to the Oregon Implementation Plan is announced. The changes are consistent with the requirements for the Federal Clean Air Act as amended and provide for expansion of the geographical limits of special control areas, increases in the distance required between residences and asphalt plants (form 1/2 mi to 1 mi), and opacity and grain loading limitations for asphalt plants. Other revisions include a new veneer drier visual emission regulation; a new sulfur dioxide emission regulation for fuel burning equipment; changes in the gasoline storage regulation requiring a vapor loss control device on tanks of 1500 gal or more; and a new wigwam visual emission regulation.

62554 **APTIC NO. 83812**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. CONNECTICUT: CONTROL OF AIR POLLUTION FROM FACILITIES OWNED, OPERATED OR UNDER CONTRACT WITH CONNECTICUT TRANSPORTATION AUTHORITY. *Federal Register, 40(104):23279-23280, May 29, 1975.*

A ruling on the Connecticut regulation on the control of air pollution from facilities owned, operated, or under contract with Connecticut Transportation Authority is announced. The Connecticut implementation plan is disapproved because the State lacks thee legal authority to control emissions and opacity limitations from sources owned or controlled by the Connecticut Transportation Authority. Federal regulations are announced for inclusion in the implementation plan, regulations identical to those originally intended by the Implementation Plan to apply to facilities of the Connecticut transportation authority.

62555 **APTIC NO. 83814**

Train, Russell E.

COMPLIANCE WITH STATIONARY SOURCE AIR POLLUTION STANDARDS. FEDERAL AGENCIES GUIDELINES. *Federal Register, 40(92):20664- 20665, May 12, 1975.*

Federal guidelines for compliance with stationary source air pollution standards are announced. The guideline provides a means to determine the compliance status of all Federal stationary sources of air pollutants which are subject to Federal, state, and local emission limitations and establish firm public commitments to abate emissions. Approximately 85% of all air pollutants from stationary sources in the United States comes from major emitters. Major emitters are capable of emitting a total of 100 ton/yr or more of a single air pollutant from all points of emission within the facility. Major emitters include: coal and residual oil-fired boilers with heat inputs of greater than 10 million BTU/hr; incinerators with a rate capacity of 2000 lb or more of refuse/hr; nitric and sulfur acid plants; coal cleaning operations; petroleum storage vessels having total capacities of 2 million gal or greater; and open burning of munitions, municipal wastes, agricultural wastes, and training schools using open flames to simulate firefighting conditions.

62556 **APTIC NO. 83815**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. APPROVAL OF REVISIONS TO WASHINGTON IMPLEMENTATION PLAN. *Federal Register, 40(100):22254-22255, May 22, 1975.*

Approval of revisions to the Washington Implementation Plan is announced. The revisions include an amendment which contains a generalized compliance schedule for all sources subject to a future effective regulation. It imposes addtional emission limitations on asphalt batch plants and requires control of fugitive dust and all wood waste burners. An addition designates sensitive areas in the state and sets more stringent requirements for wigwam burners in designated sensitive areas.

62557 **APTIC NO. 83825**

Train, Russell E.

REGULATION OF FUELS AND FUEL ADDITIVES. ADMINISTRATIVE PROCEDURES FOR CHALLENGING LIABILITY AND PENALTY ASSESSMENT. *Federal Register, 40(169):39961-39976, Aug. 29, 1975.*

Administrative procedures for challenging liability and penalty assessment of the regulation of fuels and fuel additives pertaining to unleaded gasoline are announced. The procedures establish a formal administrative hearing procedure which is used to determine both liability for penalties and their amount. The fact finding is done by an Administrative Law Judge assigned to the Environmental Protection Agency or by an impartial Presiding Officer not connected with enforcement activities. His decision is subject to review by the appropriate Regional Administrator. Judicial review of the final administrative decision will be available to determine whether it is unsupported by a substantial evidence within the meaning of the law. The formal hearing procedure is used where less formal settlement negotiations between the Environmental Protection Agency and the alleged violator fail to produce a mutually satisfactory agreement.

62558 **APTIC NO. 83925**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. PREVENTION OF SIGNIFICANT AIR QUALITY DETERIORATION. *Federal Register, 40(111):24534-24539, June 9, 1975.*

Ferroalloy production facilities are added to the list of major stationary sources. A new source performance standard for sulfur dioxide or particulate is established for the source or any facility of the source. The new source performance standard allows any anticipated future plant affected by the standard to emit SO2 or total suspended particulates in excess of 25 lb/hr from the affected facility or facilities.

62559 **APTIC NO. 83938**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. NEW JERSEY: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 40(204):49103-49105, Oct. 21, 1975.*

The approval of compliance schedules for the state of New Jersey is proposed. The original New Jersey plan failed to include transportation control strategies necessary to attain the national ambient air quality standards established for photochemical oxidants. In the revisions, each of the schedules provides for compliance by or before May 31, 1977, the date established for attainment of primary standards for photochemical oxidants in the State of New Jersey. Public comment is invited.

62560 **APTIC NO. 83943**

Train, Russell E.

NEW SOURCE PERFORMANCE STANDARDS FOR SULFURIC ACID PLANTS. EPA RESPONSE TO REMAND. *Federal Register, 40(169):39927-39932, Aug. 29, 1975. 28 refs.*

The response of the Environmental Protection Agency to remand new source performance standards for sulfuric acid plants is presented. On Sept. 10, 1973, the U. S. Court of Appeals for the District of Columbia remanded to EPA certain of the new source performance standards for sulfuric acid plants under section 111 of the Clean Air Act. The EPA reviewed its standards for these plants and tentatively concludes that the standards should not be revised.

62561 **APTIC NO. 83946**

Train, Russell E.

NONFERROUS METALS MANUFACTURING POINT SOURCE CATEGORY. *Federal Register, 40(200):48348, Oct. 15, 1975.*

Final amendments to the effluent limitations and guidelines for existing sources and standards of performance and pretreatment standards for new sources in the nonferrous metals manufacturing category of point sources are announced. The amendments on the secondary aluminum smelting subcategory are applicable to discharges of fume scrubbing wastewaters where aluminum fluoride or chlorine is used in the magnesium removal process and to wet scrubbing residue milling and metal cooling wastewaters resulting from the recovery, processing, and remelting of aluminum scrap to produce metallic aluminum alloys.

62562 **APTIC NO. 84023**

Train, Russell E.

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. INTERIM STANDARDS FOR 1977 MODEL YEAR LIGHT DUTY VEHICLES AND EMISSION STANDARDS FOR 1976 AND LATER MODEL YEAR LIGHT DUTY VEHICLES AND TRUCKS. *Federal Register, 40(109):24350-24351, June 5, 1975.*

Amendments to the interim standards for 1977 model year light duty vehicles and emission standards for 1976 and later model year light duty vehicles and trucks are issued. Exhaust emissions for 1978 and later model year vehicles shall not exceed 0.41 g/vehicle mile for hydrocarbons, 3.4 g/vehicle mile for carbon monoxide, 0.4 g/vehicle mile for oxides of nitrogen. Exhaust emissions for 1976 model year vehicles cannot exceed 1.5 g/vehicle mile hydrocarbons, 15 g/vehicle mile CO, and 3.1 g/vehicle mile NOx. Exhaust emissions from 1977 model year vehicles cannot exceed 0.41 g/vehicle mile hydrocarbons, 3.4 g/vehicle mile CO, and 2.0 g/vehicle mile NOx. Exhaust emissions for 1976 model year light duty trucks cannot exceed 2.0 g/vehicle mile hydrocarbons, 20 g/vehicle mile CO, and 3.1 g/vehicle mile NOx.

62563 **APTIC NO. 75997**

Umlauf, George E.

SYSTEM STUDY AND EVALUATION OF AIR POLLUTION EMISSIONS REPORT (FINAL REPORT). *Pacific Environmental Services, Inc., Santa Monica, Calif., Office of Air and Waste Management Contract 68-02-1378, Task Order 13, Rept. EPA-450/3-75-061, 94p., June 1975.*

An evaluation of the Environmental Protection Agency s Air Pollutant Emissions Report (APER) was conducted to determine its usefulness as a data gathering system for emission inventory and compliance with evaluation tasks. The evaluation criteria used in the appraisal included: comprehendibility by plant personnel, ability to gather emission inventory data, ability to be coded into the National Emissions Data System format, and the ability to be implemented in existing EPA data gathering programs. A system consisting of general forms and industry- specific instructions was selected as the most satisfactory alternative to the existing APER system. (Author abstract modified)

62564 **APTIC NO. 83999**

Usemann, Klaus W.

CONSTRUCTIONAL REQUIREMENTS OF BOILERS AND FUEL STORAGE ROOMS. *(Bauliche Anforderungen an Heiz- und Brennstofflagerraeume). Text in German. Heizung Lueftung Haustech., 26(12):431-437, 1975. 10 refs.*

Technical regulations for gas installations as provided by the German ordinances on gas heated boilers are reviewed with respect to their construction in the various states. All building codes require that combustion gases be led off through smokestacks and pipes. However, specifications on the distance separating exhaust pipes from combustible building materials vary with state regulations as do those on smokestack design, ventilation systems and storage of liquid natural gas. There seems to be no basis for the immense differences. It would be very advantageous for planners, builders and users alike if the unions and associations responsible could achieve a consensus and rework the present regulations and guidelines.

62565 **APTIC NO. 76397**

Varkonyi, Tibor and Magdolna Kerteszne-Saringer

AIR POLLUTION MONITORING SYSTEM IN HUNGARY. *(A legkori levegoszennyezodes ellenorzesenek rendszere Magyarorszagon). Text in Hungarian. Energiagazdalkodas, 16(10):464-466, Oct. 1975.*

The national air pollution monitoring system being set up in Hungary under the guidance of the Ministry of Public Health is described. The network will be operated by the Sanitary Epidemiological Stations in cooperation of the National Institute of Public Health. A total of 438 sampling stations will be installed in 28 communities in the first step of the project. The sulfur dioxide, carbon monoxide, nitrogen oxides, fluorides, dust, and dust lead concentrations will be measured. The use of Philips SO2 monitors and URAS CO recorders is envisaged.

62566 **APTIC NO. 82569**

Venturini, Peter D. and Douglas M. Grandy

BACKGROUND AND DEVELOPMENT OF THE CALIFORNIA VAPOR RECOVERY CONTROL PROGRAM FOR SERVICE STATIONS. *Preprint, California Air Resources Board, Sacramento, Div. of Implementation and Enforcement, 22p., 1975. 18 refs. (Presented at the North American Motor Vehicle Emissions Control Conference, Annual, 4th, Nov. 4-7, 1975.)*

The development of California s gasoline vapor recovery control programs is traced from its inception. Topics covered include: an evaluation of the extent of hydrocarbon vapor losses during tank filling and vehicle refueling operations, an analysis of the need for exemptions in specific cases, and the adoption of Suggested Vapor Recovery Rules by the California Air Resources Board. The vapor recovery rules in effect in California require 90% control by weight of the gasoline vapors displaced during the filling of service station storage containers and vehicle fuel tanks. The control of 95% or more of the vapors displaced during storage tank filling has been demonstrated. Assuming that these levels of control can be achieved, the implementation of the state s vapor recovery control program is expected to result in a reduction in service station emissions of about 221 tons/day of gasoline vapors which represents a savings of about 26 million gallons of gasoline per year. Emissions from over 400 bulk plants are expected to be reduced by about 13 tons/day for an additional fuel savings of about 1.5 million gallons of gasoline per year.

62567 **APTIC NO. 84310**

Vitale, William V.

PROCESSING AIRPORT DEVELOPMENT ACTIONS AFFECTING THE ENVIRONMENT. REFERENCES TO APPLICABLE PROCEDURES. *Federal Register, 40(162):36516-36518, Aug. 20, 1975.*

Instructions and guidance for preparing and processing the environmental assessments of airport development proposals as required by various laws and regulations are announced. An environmental impact statement is required for any action that is inconsistent with any Federal, state, or local law relating to the environment, has a significant detrimental impact on air or water quality, or on ambient noise levels for adjoining areas, or other action that directly or indirectly affects human being by creating a significant adverse impact on the environment.

62568 **APTIC NO. 83416**

Von Lehmden, Darryl J., Raymond C. Rhodes, and Seymour Hochheiser

APPLICATIONS OF QUALITY ASSURANCE IN MAJOR AIR POLLUTION MONITORING STUDIES - CHAMP AND RAMS. *Preprint, Environmental Protection Agency, Rsearch Triangle Park, N. C., Environmental Monitoring and Support Lab., 6p., 1975. 14 refs. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

Internal and external quality assurance procedures used in the Community Health Air Monitoring Program and in the Regional Air Monitoring System are reviewed. All continuous monitors which are used in CHAMP and RAMS for nitric oxide, nitrogen dioxide, ozone, sulfur dioxide, and carbon monoxide are subjected to an intensive acceptance procedure prior to installation in the fixed monitoring stations. The calibration sources for the monitors are either Standard Reference Materials or secondary and tertiary standards whose concentrations are traceable to the SRM s. Frequent calibration checks and recalibrations are performed to ensure the quality of sensor generated data. All data summaries for CHAMP and RAMS that are telecommunicated to their respective central computers also include checks on the operating performance of the fixed monitoring stations. Data transmission performance and station operator performance are also checked. Finally, on-site inspections and independent monitoring station audits are performed.

62569 **APTIC NO. 83989**

Vorwerk, Walter

RESULTS OF OFFICIAL INVESTIGATIONS: SHORTCOMINGS OF POLLUTION CONTROL. *(Ergebnisse behoerdlicher Untersuchungen: Luecken des Immissionsschutzes). Text in German. Wasser Luft Betrieb, 19(8):467, Aug. 1975. 2 refs.*

Highlights are presented of the 5th Working Report of the Regional Planning Committee for the Lower Main area. The report includes results of emission and air pollution measurements, lichen tests, and a model for air quality assessment and for the prediction of air quality and emissions. The highest air pollutant concentrations were found to occur in central urban areas with the highest population densities rather than around large chemical and other industrial plants. Therefore, air pollution control measures should be oriented mostly toward such urban areas instead of imposing highly exacting and sometimes unrealistic pollution control requirements on industries.

62570 APTIC NO. 79766

Waller, J. G.

FINANCES FOR DEVELOPING WASTE RECOVERY PROCESSES. *Chem. Eng., no. 302:596-597, 602, Oct. 1975.*

Financial assistance available to industry for developing waste recovery processes is reviewed. In the United Kingdom, the Department of Industry and Department of the Environment have several research stations in which work on waste disposal or treatment is carried out. A major program at the Warren Spring Laboratory is concerned with refuse pyrolysis to give products of fuel value. Activity overseas is largely concerned with setting standards for measuring pollutants and with setting permissive levels for discharges. A number of industries are identified for special consideration including paper and pulp, iron and steel, and titanium dioxide production. The French government gives direct assistance to industry to aid recycling. It contributes 10% of the cost of plant conversion for pollution in the sugar, and paper and pulp industries. The German Federal government accepts the pollutor pays principle, but gives support to research and development into recycling techniques. The Japanese government is taking strong measures to control discharge of pollutants. Specific aid for industry is available from the Environmental Pollution Control Service Corp. and from the Japan Development Bank mostly in the form of loans.

62571 APTIC NO. 84066

Weber, Ekkehard and Manfred Schuetz

ANNUAL REVIEW CONSERVATION OF CLEAN AIR (10TH SEQUENCE). *(Jahresuebersicht Reinhaltung der Luft (10. Folge)). Text in German. Giesserei (Duesseldorf), 62(25):662-668, 1975. 96 refs.*

Extensive recommendations are given for environmental protection in the areas of air, water, noise, solid waste and chemicals in the ecosystem. Included in the complex field of environmental policy are natural protection, landscape management, regional planning, community development and energy planning. Legal, economic and international problems are also treated. Although of a provisional nature and as yet incomplete, basic data are emphasized in the evaluations, as first steps in the regular ecological assessment of government and economic activities.

62572 APTIC NO. 83924

White, John C.

PROPOSED APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS AND STRATEGY FOR CONTROL OF SULFUR OXIDES. *Federal Register, 40(213):51203-51204, Nov. 4, 1975.*

The approval and promulgation of implementation plans and strategy for control of sulfur oxides in Oklahoma is proposed. The control strategy exhibits the application of available control technology. This control is coupled with an efficient system for review of new or modified sources, an adequate surveillance system, and a program for monitoring and enforcing the strategy. The 1970 emission inventory reports a total of 158,592 ton/yr emission with process point sources contributing 138,340 tons or 87% of the total. The 1974 emissions from process sources produce 33,767 ton/yr. The large reductions are the result of on-going control efforts by the Oklahoma State Department of Health.

62573 APTIC NO. 76610

Widman, Gary L.

ENVIRONMENTAL IMPACT STATEMENTS. LIST OF STATEMENTS RECEIVED. *Federal Register, 40(173):11172-11175, Sept. 5, 1975.*

Environmental impact statements received by the Council on Environmental Quality from August 29, 1975 are listed. Air quality would be affected by burning of forest floor fuels under the proposed 10-year management plan for the Conroe Unit of the Sam Houston National Forest. The land use plan for the South Fork Salmon River Planning Unit, Idaho, anticipates temporary air pollution due to burning of residual material after timber harvests. Two watershed protection projects would produce increased dust during construction. Adverse effects of a canal construction and improvement project in Florida also include increased dust during construction. Other environmental effects are also considered. Other projects discussed include wastewater treatment facilities and urban renewal programs. An industrial park in New York State would produce increased noise and traffic. Little or no environmental effect is anticipated for operations and maintenance of the Rio Grande in New Mexico. Statements from the National Park Service cover the Buffalo National River, Rocky Mountain National Park, and Pecos National Park. Rio Grande Canal Project improvements would alter wildlife habitats. An Air Route Surveillance Radar Facility might produce minor fossil fuel emissions. Construction of a highway in Louisiana would temporarily increase air pollution. Road improvements in Kansas would increase air pollution due to construction. Highway improvements in Ohio would produce some localized increase in air pollution.

62574 APTIC NO. 83940

Widman, Gary L.

FAA, CG, UMTA, AND HUD: ADMINISTRATIVE ACTIONS. LIST ACTIONS NEEDING ENVIRONMENTAL IMPACT STATEMENTS. *Federal Register, 40(207):49819-49820, Oct. 24, 1975.*

A list of actions needing environmental impact statements is presented. The list is filed with the Council by the Department of Transportation, Federal Aviation Administration, United States Coast Guard, and Urban Mass Transit Administration, and by the Department of Housing and Urban Development. The list indicates those administrative actions that FAA, USCG, UMTA, and HUD have determined will require the preparation of environmental impact statements under the National Environmental Protection Act. The listing includes listings of DOT Federal Aviation Administration Actions for which environmental impact Statements are in preparation of anticipated.

62575 APTIC NO. 84308

Widman, Gary L.

ENVIRONMENTAL IMPACT STATEMENTS. AVAILABILITY. *Federal Register, 40(207):49816-49818, Oct. 24, 1975.*

The availability of environmental impact statements received by the Council on Environmental Quality from Oct. 13 through Oct. 17, 1975 is announced. A final statement is issued for a residential development in New Castle County, Del. Adverse impacts of the plan include: conversion of agricultural land to urban use, some increase in air pollution and community noise levels, and some traffic congestion.

62576 APTIC NO. 75964

Wilkey, M. L., T. E. Baldwin, and S. J. LaBelle

GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS. VOLUME 13: ALLOCATING PROJECTED EMISSIONS TO SUBCOUNTY AREAS. APPENDICES A AND B (FINAL REPORT). *Argonne National Lab., Argonne, Ill., Energy and Environmental Systems Div., Office of Air and Waste Management Interagency Agreement EPA-IAG-D4-0463, Proj. 3, Program Element 2AC129, Rept. EPA-450/4-74-014a, 351p., March 1975.*

NTIS: PB 244591/AS

A test of the application of a methodology for allocating projected emissions to subcounty areas is described for Fulton County (Atlanta), Georgia. Fulton was selected as a case study because it represents a typical medium-sized Air Quality Control Region county. The case study provides an example of the kinds of data that are available, the types of assumptions that are necessary for the application of the data to the methodology, and the level of effort needed to complete the allocations for an average size county. Emission inventory data for industrial and non-industrial stationary and mobile sources of pollution are documented in an appendix.

62577 **APTIC NO. 80248**

Wilson, Kent R.

LARPP PROGRAM RECOMMENDATIONS. *Preprint, California Univ., San Diego, La Jolla, Dept. of Chemistry, 15p., 1975.*

Recommendations are made for organizing and facilitating the use of the data from a program to study urban photochemical air pollution by studying individual air parcels in the Los Angeles basin. Early and careful data communication should be worked out, including universally usable computer data handling systems, handbooks, newsletters, workshops, and provision for consultants to aid users of LARPP data. An emissions inventory should be prepared for nitric oxide, nitrogen dioxide, hydrocarbons, and carbon monoxide; and used with meteorological models to check the source functions and dispersion models. Lagrangian (trajectory) models, Eulerian (grid) models, and measured data should be compared. Effective air parcel lifetime, horizontal and vertical diffusivity, and a sufficient meteorological data base for air quality modeling should be determined. The spatial, temporal, and wavelength variation of solar radiation along each trajectory should be calculated. Testing for photo quasiequilibrium should be done. The kinetics of individual hydrocarbon species should be traced and the implication for hydrocarbon control strategies assessed. Lumped parameter kinetic schemes should be developed and evaluated. Daily carry over of pollutants should be studied. The influence of hydrocarbon to NO ratios on ozone production should be checked. The relative importance of stationary and mobile sources should be evaluated from relative concentrations of different hydrocarbon species. Prediction of three-dimensional pollution distributions from ground level measurements should be attempted. Chemical evolution in flowing gas smog chamber experiments should be compared with parcel history and model calculations. An article should be written and proposals solicite in major journals. A balance should be attempted between research funding for directed goals and soliciting and response to new ideas. (Author abstract modified)

62578 **APTIC NO. 76444**

Winthrop, S. O.

CANADA S AIR POLLUTION CONTROL PROGRAM. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 1-12. (Feb. 17-21.)*

The constitutional basis for Canada s air pollution legislation is reviewed. The Federal Government s role as described under the authority of Canada s Clean Air Act includes the establishment of goals, air quality objectives, regulatory programs, cooperation with provincial governments, and advisory services. The approach of the Canadian Government to air pollution control stresses containment at the source based on best practicable technology. National emission guidelines are being promulgated for major industry sectors, and national emission standards are being prescribed for air contaminants that constitute a significant danger to health. Motor vehicle emissions are regulated at the point of manufacture under the Motor Vehicle Safety Act. A national air pollution surveillance network in operation since 1970 is being steadily expanded. (Author abstract)

62579 **APTIC NO. 80010**

Witt, E.

ENVIRONMENTAL PROTECTION AS EUROPEAN TASK. *(Umweltschutz als europaeische Aufgabe). Text in German. Zb. Arbeitsmed., 25(11):322-326, 1975. 3 refs.*

The work undertaken in the environmental field by the Council and the Commission of the European Communities is reviewed. Work that began with specific studies has produced more than 30 concrete regulations that must now be carried out by the EEC Member States. They primarily concern water protection, including international waters, air protection (e.g., levels of lead and sulfur), and soil protection. Regulations concerning urban areas, information, and international cooperation have also been created. (Author abstract)

62580 **APTIC NO. 81509**

Wixson, Bobby G. and J. Charles Jennett

LEAD RESEARCH DATA UTILIZATION BY INDUSTRIES AND REGULATORY AGENCIES. *Preprint, Missouri-Rolla Univ., Rolla, Environmental Research Center, 16p., 1975. 15 refs. (Presented at the Trace Substances in Environmental Health, Annual 9th, Columbia, Mo., June 9-12, 1975.)*

Data obtained from a National Science Foundation sponsored study of pollution in the New Lead Belt area of Southeast Missouri as a result of lead mining and smelting activities are discussed, with particular reference to their utilization by industry and regulatory agencies. Air quality studies revealed particulate emissions from one smelter stack to be significant only for long-range deposition. Much of the local deposition originated largely from fugitive sources in the smelter work yard. Significant dust contamination appeared to be due to the transport of ore concentrates in open trucks or railroad cars. Elevated determinations of settleable lead and other heavy metals were found at locations some 3 mi from the smelter. Vegetation studies revealed elevated levels of heavy metals in or on vegetation extending 7 or more mi from smelters and 4 or more mi from mines and mills. Most lead present on vegetation appeared to originate from aerial deposit. Companies conducting lead mining, milling, and smelting activities in the region are among the most regular users of the findings. The Missouri Air Conservation Commission used data collected around two lead smelters to develop improved state standards and guidelines, and the Environmental Protection Agency used project findings to develop improved national standards for air and water pollution as well as to define problems around smelters for the development of new standards.

62581 **APTIC NO. 80360**

Yamada, S.

ON OBSERVATION OF ATMOSPHERIC BACKGROUND CONTAMINATION. *(Taiki bakkugurando osen kansoku ni tsuite). Text in Japanese. Toransupoto (Transportation), 25(9):48-52, Sept. 1975.*

The global atmospheric pollution level, which is increasing at a frightening rate with the progress of industrialization and increased automobile traffic, is reviewed with a discussion of global pollution investigation efforts. The long range global scale investigation of atmospheric background pollution levels was organized by the World Meteorological Organization (WMO) with the cooperation of member nations. The baseline air pollution is measured at locations free from local or regional pollution. Baseline air pollution stations are situated at 15 locations in seven countries, as of 1973. Regional air pollution is measured at locations where free from the direct effect of local pollutant sources. Regional air pollution stations are situated at 74 locations in 34 countries, as of 1973. Descriptions of baseline and regional air pollution measurement factors, measurement equipment, and results of measurements are also given.

62582 **APTIC NO. 84237**

Yamazaki, M.

ROADSIDE TREE PLANTING AND MANAGEMENT OF THE TREES, PART 1. *(Gairoju no shokusai to kanri). Text in Japanese. Guriin Eiji (Green Age), no. 23:58-71, Nov. 1975. 1 ref.*

Ube in Yamaguchi Prefecture was said to be the industrial city next to Manchester most polluted by factory dusts and sulfur dioxide. Now, however, after 20 years the city is covered with beautiful green roadside trees and public gardens. The historical development of the tree planting campaign is described. The plant species are described in the order of resistance to sulfur dioxide. The most resistant species are: Nerium indicum, followed by Juniperus chinensis, Euonymus Japonicus, Ligustrum Japonicum, Pittosporum tobira, Salix babylonica, and Platanus acerifolia. The following species are not resistant to sulfur dioxide: Cryptomeria, Chamaecyparis, Tsuga, Cherry trees, Camellias, fruit trees generally, and azalea. The evaluation of roadside trees, taking account of the resistance to dryness, sea winds, and harmful insects and diseases, is also described.

62583 **APTIC NO. 84107**

Yoshinari, Haruhiko and Michio Ito

REGIONAL DISTRIBUTION OF OXIDANT CONCENTRATIONS IN CHIBA. 1. APPRAISAL OF OXIDANT MONITORING STATIONS BY STATISTICAL METHODS. *(Chibaken no okishidanto nodo no bumpu. 1. Tokeitei shuho ni yoru sokuteikyoku no hyoka). Text in Japanese. Chiba-ken Kogai Kenkyusho Kenkyu Hokoku (Bull. Chiba Pref. Res. Inst. Environ. Pollut.), no. 3:81-88, March 1975. 3 refs.*

The proposed statistical classification of the 22 oxidant monitoring stations established in Chiba Prefecture to study the regional distribution of oxidant concentrations was evaluated. The 22 stations are located in six different areas of Chiba. The object of the evaluation was to determine if the measurements obtained in each area of the monitoring stations would represent the true regional characteristics of the areas. Measurements of oxidants obtained in 1974 were used to classify the monitoring stations according to the dose of oxidant concentration, oxidant concentration in relation to wind direction and velocity, and analysis of the correlation between oxidant concentrations. The classification of the monitoring stations by correlation analysis of oxidant concentrations seems to be the best possible classification to represent the true characteristics of each area. However, for best results, element analysis and composition analysis are advisable in addition to correlation analysis.

62584 **APTIC NO. 76511**

Zarytkiewicz, Edward D.

FEDERAL ENVIRONMENTAL LAWS AND REGULATIONS. *Chem. Eng./Deskbook, vol. 1975:9, 11, 13, 15, and 17, Oct. 6, 1975.*

The provisions of the Clean Air Act and Ambient Standards that affect the chemical processing industry are discussed. The Environmental Protection Agency promulgated the National Primary and Secondary Air Quality Standards which set the maximum ambient concentrations for oxidants, carbon monoxide, nitrogen dioxide, sulfur dioxide, non-methane hydrocarbons, and particulate matter. Each state was required to submit an implementation plan ensuring that the standards would be met by the statutory deadline of June 1, 1975. An Emergency Episode Plan is required by EPA for areas of the country where the ambient air quality does not meet the Primary Standard. This Plan involves shutdowns during periods when air contaminants reach high levels. The Significant Deterioration rules apply to areas where ambient air quality is superior to the Secondary Standard. They are set forth in three increasingly restrictive levels that limit industrial growth. Other regulations include New Source Performance Standards and Hazardous Air Pollutants.

62585 **APTIC NO. 73388**

Environmental Protection Agency (Japan), Administrative Vice-Minister

LAW ENFORCEMENT FOR THE AMENDMENT TO PART OF THE AIR POLLUTION CONTROL LAW. *(Taiki osen boshiho no ichibu o kaisei suru horitsu no shiko ni tsuite). Text in Japanese. Kankocho Kogaisenmon Shiryo (Public Nuisance Gaz.), 10(2):120-126, March 1975.*

The implementation of amendments (effective November 30, 1974) to air pollution control regulations is discussed. Regional total pollutant emissions are to be regulated, with consideration of meteorological, topographical, and emission source conditions for the various areas. Sulfur oxides are designated as standard pollutant particulates. Regulatory regions (eleven at this time) for sulfur oxides are formed, where emission sources for sulfur oxides are concentrated and pollution can be heavy. Areas outside these regulatory regions are covered by previous regulations for emission standards (K values). These K values will be made more stringent as conditions permit. This article also discusses methods of calculation of total pollutant standards; planning for future reduction of total particulate counts; maintenance of these standards; use of fuel in the regulatory regions; pollution in mining; and particulate emission from gas and electric power generation. The necessity for cooperation and communication between various governmental bodies is emphasized.

62586 **APTIC NO. 75952**

Office of Air and Waste Management, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

CONTROL OF PHOTOCHEMICAL OXIDANTS - TECHNICAL BASIS AND IMPLICATIONS OF RECENT FINDINGS (POLICY PAPER). *Rept. EPA-450/2-75-005, 43p., July 1975. 28 refs.*

NTIS: PB 244428/AS

An assessment of laboratory and field studies concerning the formation and control of photochemical oxidants is presented along with some implications of recent findings in terms of current and projected programs to control oxidants. Both maximum concentrations and the frequency of violations of the air quality standards for oxidants are decreasing in some urban areas as a result of recently initiated controls. However, oxidant levels well in excess of the standard are being observed in broad areas of the eastern third of the United States. Oxidants and their precursors are carried in some instances up to 50 mi from the primary pollution source. More extensive control of oxidant-producing compounds in rural areas may be required in addition to continuing emphasis on control in urban areas. The control of nitrogen oxides as well as hydrocarbons may be necessary to meet the oxidant standard nationwide. (Author abstract modified)

62587 **APTIC NO. 75953**

Argonne National Lab., Argonne, Ill., Energy and Environmental Systems Div. and Office of Air and Waste Management, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

NATIONAL SUMMARY OF STATE IMPLEMENTATION PLAN REVIEWS (SECTION 4 ESECA). VOLUME I. SYNOPSIS (FINAL REPORT). *Rept. EPA-450/3-75-053-a, 25p., July 1975.*

NTIS: PB 244418/AS

A national summary of state implementation plan reviews as required by the Energy Supply and Environmental Coordination Act of 1974 is presented as part of an effort to determine if revisions to control regulations for stationary fuel combustion sources can be made without interfering with the attainment and maintenance of the National Ambient Air Quality Standards. All 247 Air Quality Control Regions are evaluated for both total suspended particulates and sulfur dioxide. Regulations for the control of nitrogen dioxide are evaluated for only five states and do not appear to be overly restrictive. In general, particulate emission limiting regulations also do not appear to be overly restrictive. A total of 17 states have a clean fuels savings potential and unnecessarily restrictive SO2 regulations; 13 of these states currently have revisions underway. An additional four states have state implementation plan revisions which are already completed.

62588 **APTIC NO. 75954**

Argonne National Lab., Argonne, Ill., Energy and Environmental Systems Div. and Office of Air and Waste Management, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

NATIONAL SUMMARY OF STATE IMPLEMENTATION PLAN REVIEWS. (SECTION 4 ESECA). VOLUME II. TECHNICAL SUPPORT DOCUMENT (FINAL REPORT). *Rept. EPA-450/3-75-053-b, 164p., July 1975. 9 refs.*

NTIS: PB 244419/AS

A national summary of state implementation plan reviews as required by the Energy Supply and Environmental Coordination Act of 1974 is presented as part of an effort to determine if revisions to control regulations for stationary fuel combustion sources can be made without interfering with the attainment and maintenance of the National Ambient Air Quality Standards. The summary includes the objective, approach, research data, and results of the implementation plan review study. All 247 Air Quality Control Regions are evaluated for both total suspended particulated and sulfur dioxide. Regulations for the control of nitrogen dioxide are evaluated for only five states and do not appear to be overly restrictive. In general, particulate emission limiting regulations also do not appear to be overly restrictive. A total of 17 states have a clean fuels savings potential and unnecessarily restrictive SO2 regulations; 13 of these states currently have revisions underway. An additional four states have state implementation plan revisions which are already completed.

62589 **APTIC NO. 75967**

Environmental Services of TRW, Inc., Vienna, Va. and Environmental Protection Agency, Boston, Mass., Regional Office I

IMPLEMENTATION PLAN REVIEW FOR NEW HAMPSHIRE AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Office of Air and Waste Management Contract 68-02-1385, Rept. EPA-450/3-75-014, 36p., Feb. 1975.*

NTIS: PB 244916/AS

A review of the New Hampshire implementation plan as required by the Energy Supply and Environmental Coordination Act of 1974 is presented as part of an effort to determine if revisions to control regulations for stationary fuel combustion sources can be made without interfering with the attainment and maintenance of the National Ambient Air Quality Standards for sulfur dioxide and total suspended particulates. The Central New Hampshire Air Quality Control Region shows good potential for revision of emission limiting regulations for total suspended particulates. Potential for SO2 emission regulation revision exists in the Androscoggin Valley and Merrimack Valley AQCR s. Additional SO2 monitoring is needed in the Central New Hampshire AQCR before a complete assessment of the SO2 regulation revision potential can be made.

62590 **APTIC NO. 76010**

Office of Air and Waste Management, Research Triangle Park, N. C., Strategies and Air Standards Div.

POSITION PAPER ON REGULATION OF ATMOSPHERIC SULFATES (FINAL REPORT). *Rept. EPA-450/2-75-007, 106p., Sept. 1975. 68 refs.*

NTIS: PB 245760/AS

Information leading to the Environmental Protection Agency s position on atmospheric sulfate regulation is reviewed. Certain sulfates, particularly fine particulate acid sulfates, are more potent respiratory irritants than sulfur dioxide alone according to toxicological evidence. Epidemiological studies suggest that measured sulfates are associated with a variety of health disorders. Sulfates may also be related to damage to the environment by direct deposition or by acid rain formation. Visibility deterioration is also associated with sulfate levels. Sulfates in industrialized regions are largely produced by atmospheric reactions involving manmade sulfur oxide emissions. Sulfates can be transported over long distances from source areas and can result in high ambient levels over broad regions, as evidenced by observations of a 24-state region in the eastern United States. Reduction in regional SO2 emissions result in reduced sulfate levels, although the reduction is less than one to one. An additional 3 to 5 yr of research appears required before a major sulfate regulatory program is possible. Until then, the Environmental Protection Agency policy is to avoid increases in SO2 emissions in areas subject to high sulfate levels. (Author abstract modified)

62591 **APTIC NO. 76012**

Environmental Services of TRW, Inc., Vienna, Va. and Environmental Protection Agency, Philadelphia, Pa., Regional Office III

IMPLEMENTATION PLAN REVIEW FOR VIRGINIA AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Office of Air and Waste Management Contract 68-02-1385, Rept. EPA- 450/3-75-016, 56p., Feb. 1975.*

NTIS: PB 245833/AS

A review of the Virginia implementation plan as required by the Energy Supply and Environmental Coordination Act of 1974 is presented as part of an effort to determine if revisions to control regulations for stationary fuel combustion sources can be made without interfering with the attainment and maintenance of the National Ambient Air Quality Standards for suspended particulates and sulfur dioxide. The existing fuel combustion source emission limiting regulations for total suspended particulates do not appear to be overly restrictive. Emission limits for SO2 may be relaxed in some Air Quality Control Regions without exceeding the NAAQS, especially in the Hampton Roads AQCR. Marginal candidates for revision of SO2 emission regulations are the Northeastern Virginia and the Valley of Virginia ACQR s.

62592 **APTIC NO. 76057**

Environmental Protection Agency, Kansas City, Mo., Regional Office VII and TRW, Inc., Redondo Beach, Calif.

IMPLEMENTATION PLAN REVIEW FOR IOWA AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Office of Air and Waste Management Contract 68-02-1385, Rept. EPA-450/3-75-013, 68p., Feb. 1975. 13 refs.*

NTIS: PB 246288/AS

A review of the Iowa State Implementation Plan as required by the Energy Supply and Environmental Coordination Act of 1974 is presented as part of an effort to determine if revisions to the control regulations for sulfur dioxide and total suspended particulate emissions from stationary fuel combustion sources can be made without interfering with the attainment and maintenance of the National Ambient Air Quality Standards. The existing fuel combustion emission regulations for particulates do not appear to be overly restrictive since particulate levels exceeded the NAAQS in 11 of Iowa s 12 AQCR s. Limited monitoring data in all of Iowa s AQCR s shows that SO2 levels are below the NAAQS. Thus, all of Iowa s AQCR s appear to be good candidates for SO2 emission regulation revision via fuel switching.

62593 **APTIC NO. 76077**

Environmental Protection Agency, Chicago, Ill., Regional Office V and Argonne National Lab., Argonne, Ill., Energy and Environmental Systems Div.

IMPLEMENTATION PLAN REVIEW FOR MICHIGAN AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT. *Office of Air* *and Waste Management Contract EPA-IAG-D5-0463, Rept. EPA-450/3-75-003, 57p., Feb. 1975. 6 refs.*

NTIS: PB 246660/AS

A review of the Michigan State Implementation Plan as required by the Energy Supply and Environmental Coordination Act of 1974 is presented as part of an effort to determine if revisions to control regulations for sulfur dioxide and total suspended particulate emissions from stationary fuel combustion sources can be made without interfering with the attainment and maintenance of the National Ambient Air Quality Standards. There appears to be little tolerance for increased particulate emissions throughout the state. Regulation relaxation for sulfur dioxide between the present time and January 1, 1980 is not warranted due to the extensive use that the state is making of a delayed compliance provision in its implementation plan.

62594 **APTIC NO. 76078**

Environmental Protection Agency, Atlanta, Ga., Regional Office IV and Argonne National Lab., Argonne, Ill., Energy and Environmental Systems Div.

IMPLEMENTATION PLAN REVIEW FOR MISSISSIPPI AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT. *Office of Air and Waste Management Contract EPA-IAG-D5-0463, Rept. EPA-450/3-75-005, 19p., Feb. 1975.*

A review of the Mississippi State Implementation Plan as required by the Energy Supply and Environmental Coordination Act of 1974 is presented as part of an effort to determine if revisions to control regulations for sulfur dioxide and total suspended particulate emissions from stationary fuel combustion sources can be made without interfering with the attainment and maintenance of the National Ambient Air Quality Standards. There is little margin for relaxed particulate emission regulations since each region is either experiencing high particulate levels or has little clean fuels savings that would result from regulation revision. A significant tolerance for increased SO2 emissions is indicated for the Metropolitan Memphis, Mississippi Delta, and Northeast Mississippi Air Quality Control Regions. No annual average air quality data are available, however.

62595 **APTIC NO. 76079**

Environmental Protection Agency, San Francisco, Calif., Regional Office IX and TRW, Inc., Redondo Beach, Calif., Environmental Services Div.

IMPLEMENTATION PLAN REVIEW FOR NEVADA AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Office of Air and Waste Management Contract 68-02-1385, Rept. EPA-450/3-75-007, 47p., Feb. 1975. 6 refs.*

NTIS: PB 246635/AS

A review of the Nevada State Implementation Plan as required by the Energy Supply and Environmental Coordination Act of 1974 is presented as part of an effort to determine if revisions to control regulations for sulfur dioxide and total suspended particulate emissions from stationary fuel combustion sources can be made without interfering with the attainment and maintenance of the National Ambient Air Quality Standards. Although Nevada uses the Example Region Approach in developing control strategies for both total suspended particulates and SO2 and has a 24-hour SO2 air quality standard more restrictive than the NAAQS, there are no clear indications that current regulations for either pollutant are overly restrictive. Additional monitoring and modeling in the vicinity of major sources such as the Mohave Power Plant are necessary before a final determination can be made concerning the stringency of regulations.

62596 **APTIC NO. 76080**

Environmental Protection Agency, Chicago, Ill., Regional Office V and Argonne National Lab., Argonne, Ill., Energy and Environmental Systems Div.

IMPLEMENTATION PLAN REVIEW FOR MINNESOTA AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT. *Office of Air and Waste Management Contract EPA-IAG-D5-0463, Rept. EPA-450/3-75-033, 56p., March 1975. 7 refs.*

NTIS: PB 246367/AS

A review of the Minnesota State Implementation Plan as required by the Energy Supply and Environmental Coordination Act of 1974 is presented as part of an effort to determine if revisions to control regulations for sulfur dioxide and total suspended particulate emissions from stationary fuel combustion sources can be made without interfering with the attainment and maintenance of the National Ambient Air Quality Standards. There is little tolerance throughout the state for increased particulate emissions based on high particulate readings and several proposed Air Quality Maintenance Area designations. There is a substantial margin for increased SO2 emissions in all regions except Minneapolis-St. Paul. Despite these indications, Central Minnesota, Metropolitan Fargo-Moorhead, Northwest Minnesota, and Southwest Minnesota are rated as having poor potential for SO2 regulation relaxation based on the fact that the majority of plants in the region are small and/or there is little potential for clean fuel savings. Some regulation revision for Minneapolis-St. Paul might be possible despite the high SO2 levels based on modeling results indicating substantial low sulfur coal savings potential for the state s largest power plant.

62597 **APTIC NO. 76141**

Office of Air and Waste Management, Research Triangle Park, N. C., Office of Air Quality Planning and Standards and Environmental Protection Agency, Washington, D. C., Office of Enforcement

STATE AIR POLLUTION IMPLEMENTATION PLAN PROGRESS REPORT, JANUARY 1 TO JUNE 30, 1975 (PROGRESS REPORT). *Rept. EPA-450/2-75-008, 467p., Sept. 1975. 2 refs.*

NTIS: PB 247682/AS

The attainment status of State Implementation Plans for the control of total suspended particulates and sulfur dioxide is reviewed for each state by Air Quality Control Region. The status of selected portions of SIP s and selected source categories is reviewed along with enforcement actions, manpower and funding resources, ambient air quality monitoring activities, and air quality maintenance areas. Over 53% of the AQCR s appear likely to attain primary total suspended particulate Ambient Air Quality Standards by the statutory date, and over 73% are expected to attain the SO2 standards. Among 19,360 major emitters, 84% are now in compliance with either an emission standard or an acceptable compliance schedule. (Author abstract modified)

62598 **APTIC NO. 76173**

Environmental Protection Agency, New York, Regional Office II and TRW, Inc., Vienna, Va.

IMPLEMENTATION PLAN REVIEW FOR VIRGIN ISLANDS AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Contract 68-02-1385, Rept. EPA-450/3-75-001, 34p., Jan. 1975. 8 refs.*

NTIS: PB 247987/AS

A review of the Virgin Islands Implementation Plan, as required by the Energy Supply and Environmental Coordination Act of 1974, is presented to determine if revisions to control regulations for total suspended particulate and sulfur dioxide emissions from stationary fuel combustion sources can be made in an effort to effect clean fuel savings. No potential exists for revising fuel combustion source emission regulations for total suspended particulates, whereas some potential appears to exist for relaxing SO2 emission regulations. The Virgin Islands are in the process of developing a regulation which is compatible with the intention of Section IV of the ESECA. (Author summary modified)

62599 **APTIC NO. 76174**

Environmental Protection Agency, Chicago, Ill., Regional Office V and Argonne National Lab., Argonne, Ill., Energy and Environmental Systems Div.

IMPLEMENTATION PLAN REVIEW FOR ILLINOIS AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT. *Interagency Agreement EPA-IAG-D5-0463, Rept. EPA-450/3-75-004, 57p., Feb. 1975. 6 refs.*

A review of the Illinois State Implementation Plan, as required by the Energy Supply and Environmental Coordination Act of 1974, is presented to determine if revisions to control regulations for emissions from stationary fuel combustion sources can be made in an effort to effect clean fuel savings. There is little tolerance throughout the state for relaxed particulate emission regulations. A margin for increased sulfur dioxide emissions exists in the Metropolitan Dubuque, Metropolitan Quad Cities, Paducah-Cairo, and Rockford-Janesville-Beloit Air Quality Control Regions. There may also be significant potential for clean fuel savings in the Burlington-Keokuk AQCR, although the result must be qualified by the existence of proposed SO2 Air Quality Maintenance Areas in Peoria, Tazewell, and Woodford counties. Any change in SO2 or particulate regulations in the Metropolitan Chicago AQCR must be considered in light of the impact on nitrogen oxide emissions which are high in the area.

62600 **APTIC NO. 76176**

Environmental Protection Agency, Denver, Colo., Regional Office VIII and TRW, Inc., Redondo Beach, Calif.

IMPLEMENTATION PLAN REVIEW FOR NORTH DAKOTA AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Contract 68-02-1385, Rept. EPA-450/3-75-008, 55p., Feb. 1975. 10 refs.*

NTIS: PB 247972/AS

A review of the North Dakota State Implementation Plan, as required by the Energy Supply and Environmental Coordination Act of 1974, is presented to determine if revisions to control regulations for total suspended particulate and sulfur dioxide emissions from stationary fuel combustion sources can be made in an effort to effect clean fuel savings. The stationary source fuel combustion particulate emission regulation does not appear to be a good candidate for revision. Sulfur dioxide levels in the state appear to be below the National Ambient Air Quality Standards; however, SO2 emissions from most major fuel combustion sources are also well below regulation allowables. Significant levels of fuel switching can occur within the limits of the present emission regulations which do not appear to be overly restrictive in this context. An evaluation of the impact of allowing sources to emit up to the regulating limits is recommended before further relaxation of the present SO2 emission regulations is considered.

62601 **APTIC NO. 76177**

Environmental Protection Agency, Denver, Colo., Regional Office VIII and TRW, Inc., Redondo Beach, Calif.

IMPLEMENTATION PLAN REVIEW FOR SOUTH DAKOTA AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Contract 68-02-1385, Rept. EPA-450/3-75-009, 49p., Feb. 1975. 10 refs.*

NTIS: PB 248393/AS

A review of the South Dakota State Implementation Plan, as required by the Energy Supply and Environmental Coordination Act of 1974, is presented to determine if revisions to control regulations for total suspended particulate and sulfur dioxide emissions from stationary fuel combustion sources can be made in an effort to effect clean fuel savings. The stationary source fuel combustion particulate emission regulation is not a good candidate for major revision due to the fact that total suspended particulate problems exist in three of the state s four Air Quality Control Regions. Sulfur dioxide levels in the state are below the NAAQS; however, SO2 emissions from most major fuel combustion sources are also well below regulation allowables. Significant fuel switching is possible within the limits of the present emission regulations which do not appear overly restrictive in this context. An evaluation of the effect of allowing sources to emit up to regulation limits is recommended before further relaxation of the present SO2 emission regulation is considered. (Author summary modified)

62602 **APTIC NO. 76178**

Environmental Protection Agency, Philadelphia, Pa., Regional Office III and TRW, Inc., Vienna, Va.

IMPLEMENTATION PLAN REVIEW FOR PENNSYLVANIA AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Contract 68-02-1385, Rept. EPA-450/3-75-019, 60p., Feb. 1975.*

NTIS: PB 247796/AS

A review of the Pennsylvania State Implementation Plan, as required by the Energy Supply and Environmental Coordination Act of 1974, is presented to determine if revisions to control regulations for total suspended particulate and sulfur dioxide emissions from stationary fuel combustion sources can be made in an effort to effect clean fuel savings. Existing fuel combustion emission regulations do not appear to be overly restrictive for either particulate or SO2 emissions. National Ambient Air Quality Standards for particulates were exceeded in each of the six Air Quality Control Regions in the state during 1973; and ambient air quality standards for SO2 were exceeded in the Metropolitan Philadelphia, Northwest Pennsylvania, and the Southwest Pennsylvania ACQR s. (Author summary modified)

62603 **APTIC NO. 76179**

Environmental Protection Agency, Philadelphia, Pa., Regional Office III and TRW, Inc., Vienna, Va.

IMPLEMENTATION PLAN REVIEW FOR WEST VIRGINIA AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Contract 68-02-1385, Rept. EPA-450/3-75-020, 50p., Feb. 1975.*

NTIS: PB 247772/AS

A review of the West Virginia State Implementation Plan, as required by the Energy Supply and Environmental Coordination Act of 1974, is presented to determine if revisions to control regulations for total suspended particulate and sulfur dioxide emissions from stationary fuel combustion sources can be made in an effort to effect clean fuel savings. Existing fuel combustion source emission regulations for both SO2 and suspended particulates do not appear to be overly restrictive. Additional air quality data for SO2 are needed in most of the state s Air Quality Control Regions, however, before any regulation relaxation is considered. (Author summary modified)

62604 **APTIC NO. 76180**

Environmental Protection Agency, Kansas City, Mo., Regional Office VII and TRW, Inc., Redondo Beach, Calif.

IMPLEMENTATION PLAN REVIEW FOR MISSOURI AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT. *Contract 68-02-1385, Rept. EPA-450/3-75-023, 65p., Feb. 1975. 14 refs.*

NTIS: PB248230/AS

A review of the Missouri State Implementation Plan, as required by the Energy Supply and Environmental Coordination Act of 1974, is presented to determine if revisions to control regulations for total suspended particulate and sulfur dioxide emissions from from stationary fuel combustion sources can be made in an effort to effect clean fuel savings. Existing regulations for particulate emissions from fuel combustion sources do not appear to be overly restrictive, whereas regulations for SO2 emissions from very large fuel burning sources may be overly restrictive. There are no indications that SO2 emissions from power plants in the Missouri portion of the St. Louis area are causing violations of the SO2 air quality standards, and these sources show potential for regulation revision. Close coordination with the state of Illinois, however, is recommended if the state of Missouri should decide to revise its current SO2 emission regulations. (Author summary modified)

62605 **APTIC NO. 76260**

ENVIRONMENTAL POLLUTION AND LEGISLATIVE CONTROL IN JAPAN. *Petrol. Rev., 29(342):390-392, June 1975.*

Changing Japanese energy and resource economic patterns could produce a 10 50 40% reduction in the emission of sulfur oxides without reducing the gross national product and without changing the sulfur content of fuels. It is the basic policy of the Japanese Government that legislative control over the emission of pollutants should be placed on industry. Japan reinforced its environmental legislation in 1970. Control of environmental pollution should have priority over economic development. The national Government is responsible for the institution of environmental quality standards relating to individual pollutants. The National Government is also responsible for the establishment of emission standards for individual pollutants discharged at each emission source. Industry is required to share the costs of public works needed to improve the environment and to contribute to the relief of pollution victims. The environmental quality standards for sulfur oxides and nitrogen oxides in Japan are much more stringent than the primary air quality standards in the USA. Japanese new car emission standards are based on the original 1975 Federal standards in the USA except for a more severe nitrogen oxides limit. Despite development of the rotary engine and the stratified charge engine, the use of catalytic converters is still the mainstream device to meet the 1975 emission standards. Because of technical difficulties, the Government decided to relax the 1976 emission standard for nitrogen oxides and its contemplating measures for restricting motor traffic.

62606 **APTIC NO. 76349**

Bunkyo Ward Office (Japan)

ENVIRONMENTAL POLLUTION IN BUNKYO WARD IN 1974. *(Bunkyo-ku no kogai: Showa 49-nendoban). Text in Japanese. 167p., June 1975.*

Various pollution data (air, water, automobile, noise) for Bunkyo Ward, Tokyo, for 1974 are compiled in this report. Bunkyo Ward, with a population of about 210,000 (1950), covering 11.44 sq km, is 20th in area size of the 23 Tokyo wards, and contains about 1.8% of the total metropolitan population. About 180 institutions of learning abound in the area. Book-publishing and printing, student rooming houses, medical instrument manufacture and wholesale enterprises, and entertainment areas comprise the commercial profile of the ward. The Department of Pollution was established in 1969. Complaints are handled by visits to homes of the complainants, ascertaining the situation, followed by appropriate action. The original ward budget for 1974 was $46.3 million, of which $264,500 was earmarked for pollution countermeasures. Allotments included $10,500 for air pollution, $5100 for photochemical smog, and $2400 for water quality. Funds and loans for pollution control amounted to $47,000. In a 1974 questionnaire on noise, answered by 472 persons, 187 persons were troubled by noise. Pollution complaints have been decreasing since 1970, but with the addition of new complaint categories covering noise, vibrations, and malodors an increase occurred from 164 complaints (1973) to 186 complaints (1974). Since 1973, deterioration of oxidant-sensitive rubber rings has been used to measure photochemical oxidants. For the period from May to September 1974, total average oxidant concentrations, measured at 33 locations in the ward, ranged from 2.0 to 3.1 pphm at each location. Weekly average concentrations including all 33 locations ranged from 1.1 to 4.3 pphm during the same period.

62607 **APTIC NO. 79257**

Federal Energy Administration, Washington, D. C.

ELECTRIC UTILITIES, CLEAN AIR ACT AMENDMENTS, AND SULFATE. *54p., July 8, 1975.*

The basis is provided for the Administration s proposed Clean Air Act amendments that apply to stationary sources and the use of coal. Sulfur dioxide should be controlled to meet existing air quality standards. New Source Performance Standards should be used to control pollution from new power plants. An Intermittent Control System should be allowed for existing power plants in rural areas until 1985. Sufficient information is not now available to set a standard for sulfate. Background material on the energy problem, the President s proposed energy program, and the Federal Energy Administration s coal conversion and load management programs is also provided.

62608 **APTIC NO. 79758**

Saitama Prefectural Government, Div. of Environment

RESULTS OF OXIDANT MONITORING BY MOBILE AIR POLLUTION MONITORING UNIT. *(Taiki osen sokuteisha ni yoru okishidanto sokutei kekka). Text in Japanese. In: Course of and Countermeasures in Photochemical Pollution Occurrence in Saitama Prefecture, p. 55-60, March 1975.*

A mobile air pollution monitoring vehicle was stationed, 3 weeks at a time, at ten locations in the northern part of Saitama Prefecture, Japan, during April to November 1974. Oxidant concentrations above the warning level (0.15 ppm) occurred at four of these locations, where measurements were taken in the months of May through September. Maximum oxidant concentration of 0.21 ppm was found. In comparison to the southern part of the prefecture, frequency of occurrence is still low, duration of oxidant warnings is short, and peak concentrations of pollutant appear late in the day (5-7 pm). In Saitama Prefecture, there are 34 large-scale factories which must reduce usage of fuel in soot (SO2)-producing facilities when oxidant alerts are announced. On-site inspections and patrols in 1974 found that 27 factories were following fuel-reduction measures during the alerts, in accordance with procedures filed with the authorities.

62609 **APTIC NO. 80207**

Environment Agency, Tokyo (Japan), International Affairs Div.

AUTOMOBILE EMISSION STANDARDS ESTABLISHED 1976. RESULTS OF 1973 NATIONWIDE WATER QUALITY SURVEY BARED. NUMBER OF 1973 ENVIRONMENTAL POLLUTION COMPLAINTS BARED. *Japan Environ. Summ., 3(3):1-4, March 10, 1975.*

A summary of Japanese environmental action is presented including the establishment of 1976 automobile emission standards and environmental pollution complaints. The regulations include reinforcement of the nitrogen oxides standards for gasoline or liquid petroleum gas (LPG)-powered passenger cars with capacity for 10 persons or less and establishment of new regulations on exhaust hydrocarbons emitted from gasoline or LPG-powered trucks in use. The number of environmental pollution complaints received by local governments from residents in fiscal 1973 totaled 86,777 cases. Complaints about offensive odor number 19,674 cases (23%), and air pollution complaints number 14,234 cases (16%). Complaints about offensive odor dropped by 1902 cases or 8.8% from the year before and those about air pollution by 862 cases or 5.7%. Manufacturing plants accounted for 48% of the complaints. Other outstanding pollution sources are dairy, pig, and poultry farms, and construction and civil engineering works. Other topics include an environmental administration seminar held in Tokyo and the results of 1973 nationwide water quality survey.

62610 **APTIC NO. 80247**

National Academy of Sciences, National Research Council, National Academy of Engineering, Washington, D. C.

REPORT OF THE CONFERENCE ON AIR QUALITY AND AUTOMOBILE EMISSIONS TO THE COMMITTEE ON ENVIRONMENTAL DECISION MAKING. *26p., June 5, 1975. 10 refs.*

The conclusions and recommendations of the conference are discussed. Emission standards for hydrocarbons and carbon monoxide for 1978 model light duty vehicles should be maintained at the current statutory levels. The statutory emission standard for nitrogen oxides can probably be achieved with catalyst technology in 1978. The costs of achieving this standard are summarized. Adherence to the NOx standard will discourage technologies which offer benefits such as better fuel economy, but with which NOx control is difficult. Marginal benefits and costs of achieving in 1978 the statutory NOx emission standard are discussed. If the emission standard for NOx is relaxed, a two car strategy should require vehicles in areas with more severe pollution to meet more stringent emission standards. A sulfuric acid light duty motor vehicle emission standard for 1978 and subsequent model yr should be established to insure that technology to meet the HC, CO, and NOx standards does not significantly increase ambient concentrations of sulfuric acid and acid sulfates. A 1 hour ambient air quality standard for nitrogen dioxide and ambient air quality standards for sulfuric acid and acid sulfates should be developed. Emissions and health effects of other non-regulated pollutants from motor vehicles should be examined carefully. Significant improvement in fuel economy can be achieved by changes independent of the level of emissions. There is a need to complete development of emission standards and more effective controls for mobile and stationary sources of HC, CO, NOx, and H2SO4 other than light duty motor vehicles. (Author abstract modified)

62611 **APTIC NO. 80403**

Economics and Science Planning, Inc.

RECOMMENDED U.S. AUTOMOTIVE EMISSION STANDARDS. *Rept. 75-SP-0409, 35p., Feb. 3, 1975.*

NTIS: PB-240 346

An automotive emission standard for all states except California of 2, 20, and 3.1 g/mile of hydrocarbons, carbon monoxide, and nitrogen oxides emissions, respectively, will meet ambient air quality standards where they can be met. The Federal Interim Standards of 1.5, 15, and 3.1 g/mile HC, CO, and NOx, respectively, will not achieve air quality that is measurably better. Reducing allowable lead additives to approximately 1 g/gallon from the national level of 2.5 g will meet ambient air quality requirements for that pollutant. This slight relaxation of the Federal Interim Standards may have the greatest fuel economy benefit/cost increment or safety decrement of the options available to public policy. (Author abstract modified)

62612 **APTIC NO. 81086**

PUBLICATIONS INCLUDED IN THE COLLECTION OF THE EMENDED MINISTERIAL BULLETIN FOR THE STATE OF NORTHRINE-WESTPHALIA AND PUBLICATIONS NOT INCLUDED IN THE COLLECTION OF THE EMENDED MINISTERIAL BULLETIN FOR THE STATE OF NORTHRINE-WESTPHALIA. *(Veroffentlichungen, die in die Sammlung des vereinigten Ministerialblattes fur das Land Nordrhein-Westfalen (SMBl.NW) aufgenommen werden.)* and *(Veroffentlichungen, die nicht in die Sammlung des vereinigten Ministerialblattes fur das Land Nordrhein-Westfalen (SMBl.NW.) aufgenommen werden). Ministerialbaltt Fur Das Land Nordrhein- Westfalen, vol. 65:965-1008, 1975. 3 refs. Translated from German, 58p.*

A preliminary regulation provides for uniform criteria and evaluative procedures for license applications for petroleum product refineries and petrochemical plants for hydrocarbon production. The regulation applies to furnaces, claus plants, product storage, transporting and conveying products, loading of products, purification and maintenance tasks, a relief system, excess gas burning systems, sewage treatment, and sludge combustion. Emission limits are also provided for catalyst regeneration and total emissions relative to throughput, and overlapping requirements are discussed. Wind measurement systems and overlapping requirements for monitoring are also discussed. Deviations from the regulation are permissible if the applicant can demonstrate equivalence with respect to the preservation of clean air. The conditions under which an immission prognosis is required for the construction of a new refinery or petrochemical plant are discussed. An assessment should be made of which emission components by type, amount, drainage conditions, time distribution, and initial load can be expected to be decisive. An index should be compiled with all the data pertaining to the emission for these emission components. Bases for the mathematical determination of the expected immission load are discussed, including the basic dispersion equation, effective excess height, meteorological data, disperion classes, wind velocity levels, dispersion coefficients, the wind velocity profile, and obtaining data. The calculation procedure for determining additional load is described, including the plotted point system, mathematical treatment of sources which vary considerably, multiple emission sources, uncertainties of the calculation method, and dispersion conditions that cannot be calculated. Determination of the total load is discussed, including measurement of the initial load. Immission limits are given for emission components occurring frequently in petrochemistry. The means of evaluating the permissibility of an annoying effect from emissions is discussed.

62613 **APTIC NO. 82112**

ORDINANCE ON DRYCLEANING INSTALLATIONS -- 2ND FEDERAL IMMISSIONS PROTECTION ORDINANCE. *Intern. Digest Health Legislation, 26(3): 552, 1975.*

Dry-cleaning must be equipped with filters to ensure that their emissions do not exceed 30 cu cm/cu m trichloroethylene or perchloroethylene. The operator of the installation is required to provide for a sealable inspection opening in a straight section of the used-air pipe beyond the filter, for measuring purposes. Certain German Land ordinances on this subject are repealed.

62614 **APTIC NO. 82113**

ORDINANCE ON FUEL-BURNING INSTALLATIONS -- 1ST FEDERAL IMMISSIONS PROTECTION ORDINANCE. *Intern. Digest Health Legislation, 26(3):550-552, 1975.*

The construction, characteristics, and operation of fuel-burning installations using solid and liquid fuels are regulated by German federal law. The installations must be operated in such a way that the smoke plume is clearer than 2 on the Ringelmann scale. Installations with small vaporizing burners having a nominal calorific output of up to 40,000 kJ/hr must be constructed so that the darkness index of the dust and soot emissions does not exceed the value expressed by smoke shade 4 on the comparative scale and the flue gases are free from oil derivatives to the extent that the filter paper used in the test procedure described does not display any visible traces of such derivatives. The provision on oil derivatives also applies to installations with atomizing burners having a nominal calorific output less than 40,000 kJ/hr. All installations with atomizing burners must be operated so that the darkness index of the dust and soot emissions does not exceed the value expressed by smoke shade 3 and the proportion of carbon dioxide by volume in the flue gas is at least 7% for existing installations and at least 10% for new and modified installations. Installations using solid fuels and having a nominal calorific output of up to 80,000 kJ/hr must use low-smoke fuels. Installations using solid fuels and having a nominal calorific output exceeding 80,000 kJ/hr must be operated so that the mass concentration of dust, soot, and tar in the flue gas does not exceed 150 mg/cu m of the flue gas for manually-fed installations or 300 mg/cu m for mechanically-fed installations. Various earlier provisions issued by the West German Lander are repealed.

62615 **APTIC NO. 82204**

Osaka Environmental Pollution Control Center

BULLETIN OF THE OSAKA ENVIRONMENTAL POLLUTION CONTROL CENTER, NO. 1. *(Osakafu kogai kanshi senta shoho, dai 1-ho). Text in Japanese. 135p., Nov. 1975.*

The business conducted by the Osaka Environmental Pollution Center for the past 7 years is described, including, chronologically, the research undertaken and the publications on environmental pollution.

62616 **APTIC NO. 82455**

GOVERNMENT DRAFT FOR A SUPPLEMENTARY LAW TO THE GASOLINE LEAD ACT. *(Regierungsentwurf fuer ein Ergaenzungsgesetz zum Benzinbleigesetz). Text in German. Erdoel Kohle - Erdgas-Petrochem.), 28(9):445-447, Sept. 1975. 17 refs.*

A government draft for a supplementary law to the Gasoline Lead Act promulgated recently in West Germany is discussed. According to the Gasoline Lead Act, the lead content in gasoline is limited to 0.15 g/liter effective January 1, 1976. While this Act is realistic for regular gasoline, the unavailability of low-lead premium has prompted the government draft of a hardship clause according to which the imports and distribution of gasoline with higher lead content can be permitted by exemption until the end of 1977 if compliance with the Gasoline Lead Act would cause supply shortages. The federal government will be making efforts to harmonize the related legislation in the member countries of the European Economic Community to avoid distortions in competition.

62617 **APTIC NO. 82547**

ENVIRONMENTAL PROTECTION: WASTE DISPOSAL AND CONTROL OF WATER POLLUTION, AIR POLLUTION, AND NOISE. *Intern. Digest Health Legislation, 26(3):627-652, 1975.*

The provisionss of the Control of Pollution Act 1974 in the United Kingdom are presented. The Secretary of State may impose regulations on the composition and contents of any fuel used in motor vehicles. Where such regulations are in force, the Secretary may prevent or restrict the production, treatment, distribution, import, sale or use of any fuel which in any respect fails to comply with the criteria, and which is for use in the United Kingdom. The Secretary may impose limits on the sulfur content of fuel oil which is used in furnaces or engines.

62618 **APTIC NO. 82716**

Bay Area Air Pollution Control District, San Francisco, Calif.

GUIDELINES FOR AIR QUALITY IMPACT ANALYSIS OF PROJECTS. *67p., June 1975. 12 refs.*

Air quality impact analysis guidelines proposed by the San Francisco Bay Area Air Pollution Control District are presented. The guidelines include general requirements and instructions, suggested methods for quantifying air quality impacts, and report formats. Computation sheets and impact summary forms are filled out in detail with reference to a hypothetical project site plan. Separate computation forms are used to analyze point, line, and area source impacts as well as the impact of individual airport runways. (Author abstract modified)

62619 **APTIC NO. 83007**

National Research Council, Washington, D. C., Environmental Studies Board

DECISION MAKING FOR REGULATING CHEMICALS IN THE ENVIRONMENT. *Environmental Protection Agency Contract 68-01-2262, 232p., 1975. 23 refs.*

The key aspects of the process for making regulatory decisions about chemicals in the environment are analyzed. The primary focus is on industrial chemicals and on federal decision making. The statutory framework, the participation of groups outside a regulatory agency, and the use of information within the agency are considered. The initial decision process for which a regulatory agency is responsible should be so strengthened by the proper use of adequate scientific and economic information that there will be less likelihood that the ultimate issue will be decided in the courts. Cost-benefit and decision frameworks are described for organizing and summarizing relevent data on regulatory alternatives which the decision maker must review. Value judgements about noncommensurate factors in a decision such as life, health, aesthetics, and equity should be explicitly dealt with by the politically responsible decision makers and not hidden in purportedly objective data and analysis. The decision process should require the agency s technical staff to present a full set of options with a corresponding range of cost-benefit-hazard data and explicit statements on the confidence limits of each analysis. The Environmental Protection Agency should adopt, whenever scientifically possible, a generic approach, as opposed to an ad hoc procedure, for the regulation of chemicals. (Author abstract modified)

62620 **APTIC NO. 83342**

CONTROL OF AIR POLLUTION: GASEOUS EMISSIONS FROM MOTOR VEHICLES. *Intern. Digest Health Legislation, 26(3):604, 1975.*

The decree on the control of air pollution from gaseous emissions from motor vehicles in Spain is summarized. Decree no. 3025 of Aug. 9, 1974 establishes norms for the operation of motor vehicles and standardizes procedures for measuring their gaseous emissions. The Ministry of Industry is responsible for undertaking the approval of types of motor vehicles, verifying the conformity of mass produced vehicles, and carrying out the period inspection of vehicles. The General Directorate of Health (at the national level) and the municipalities are to conduct periodic measurements of the ambient atmosphere to determine whether the imposition of more stringent measures is necessary. Other provisions deal with obligations of a general character, measuring instruments, the technical inspection of vehicles, and contraventions and penalties. Annex I deals with the determination of the carbon monoxide content of the exhaust gases from vehicles with positive ignition engines when set at the idling position, while Annex II deals with the measurement of the opacity of the exhaust fumes emitted by motor vehicles with diesel engines.

62621 **APTIC NO. 83533**

CONTROL OF AIR POLLUTION: MISCELLANEOUS PROVISIONS. *Int. Digest Health Legislation, 26(3):657, 1975.*

The miscellaneous provisions of the Clean Air Enactments (Repeals and Modifications) Regulations 1974 of the United Kingdom are summarized. The regulations contain repeals and modifications of provisions of the following Acts and instruments: the Alkali, and c. Works Regulation Act 1906; the Public Health (Smoke Abatement) Act of 1026 (entirely repealed); the Clean Air Act 1956; the Clean Air Act 1968, (Section 11 (5) is repealed); the Alkali, and c. Works (Registration) Order 1957; the Control of Pollution Act 1974 and certain Scottish texts. The Regulations are made in consequence of the establishment of the Health and Safety Executivve and the coming into force on Jan. 1, 1975 of provisions of the Health and Safety at Work Act 1974 which supersedes or affects provisions of the abovementioned texts. Among other provisions, the Regulations transfer certain powers under the 1906 Act connected with its enforcement from the Secretary of State to the Health and Safety Executive; transfer the functionns of inspectors appointed under the 1906 Act to inspectors appointed by the Health and Safety Executive under the 1974 Act; and repeal powers and provisions which are superseded by powers and provisions contained in the 1974 Act.

62622 **APTIC NO. 83534**

ENVIRONMENTAL PROTECTION: FEDERAL ENVIRONMENT AGENCY. *Int. Digest Health Legislation, 26(3):521-522, 1975.*

The legislation of July 22, 1974 establishing the Federal Environment Agency in the Federal Republic of Germany is summarized. The Agency is under the jurisdiction of the Federal Minister of the Interior. The tasks of the Agency include: providing the Federal Minister of the Interior with scientific assistance in all matters relating to protection against immissions and waste management, particularly in the drawing up of statutory and administrative provisions, research on and the development of principles government the adoption of appropriate measures, and the testing and investigations of processes and installations; organizing and operating an environmental planning information system and an environmental documentation center, enlightening the public on environmental matters, making available central services and resources for the purposes of environmental research and for the coordination of Federal environmental research, and assisting in investigations of the environmental compatibility of measures taken by the Federal Government.

62623 **APTIC NO. 83535**

CONTROL OF AIR POLLUTION: PENAL PROVISIONS. *Int. Digest Health Legislation, 26(3):464, 1975.*

The provisions of Decree No. 5287 of July 23, 1973 to amend Section 413 of the Penal Code of Costa Rica are summarized. The Decree lays down the penalties imposed on managers or owners of industrial undertakings who fail to adopt the appropriate measures to prevent the escape of fumes, vapors, or gases creating a nuisance to the public or a danger to health, or who fail to ensure the disposal of wastes causing environmental pollution. The same penalties are imposed on persons owning or hiring motor vehicles producing emissions of carbon monoxide, fumes, or other sources of air pollution creating a nuisance to the public or a danger to health.

62624 **APTIC NO. 83544**

Japan Steel Assoc.

EXAMPLES OF TECHNICAL SOLUTIONS FOR THE TOTAL-AMOUNT REGULATION OF NOX. METHODS OF REMOVAL OF NITROGEN OXIDES IN STEEL INDUSTRY. *(NOx soryo kisei ni taio suru gijutsuteki taiosaku no jitsurei. Tekkogyo ni okeru chisso sankabutsu bojosaku ni tsuite). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(6):61-65, June 1975.*

The present status of the determination of standards for nitrogen oxides emissions in the steel industry, countermeasures against NOx in the steel industry, and NOx control techniques are summarized. The Japanese Environment Agency decided on the standards for nitrogen dioxide in April 1974. The concentration of discharged NO2 should be less than 0.02 ppm, as a daily average of the 1-hour value. This standard is the most severe in the world. To meet the requirements of this standard, about 60 companies in the steel industry in Japan began cooperation. An association and a center were established for technical studies and for the collection of information. About $28,000,000 is going to be invested for studies on the mechanism of NOx formation, methods of measuring NOx, techniques to control NOx discharge, and techniques to remove NOx. A number of universities will join the studies. More than $140,000 was given to Osaka University in March 1974. Tokyo University received $100,000.

62625 **APTIC NO. 83741**

JURISDICTION DEMONSTRATES THE STRICTNESS OF THE FEDERAL IMMISSION PROTECTION ACT. *(Rechtsprechung verdeutlicht Schaerfe des Bundes-Immissionsschutzgesetzes). Text in German. Wasser Luft Betrieb, 19(12):715-716, 1975.*

The German Parliament has before it a proposed amendment to previous air pollution laws, which provides that industrial installations shall be operated such that: harmful environmental effects and other dangers are not permitted; precautions are to be taken against such harmful effects, including use of advanced technology to keep emissions within limits; and residues from plants are to be rendered harmless, or, if this is not possible, to be removed or refuse. This has raised the question for Hamburg authorities about strict interpretation of the law and whether or not there could be immediate approval for the Reynolds aluminum smelter, concerning which there has been previous litigation.

62626 **APTIC NO. 83843**

Osaka Municipal Office (Japan)

CLEAN AIR PLAN IN 1973. AIR POLLUTION CONTROL PLAN. *(Kurin eapuran 1973. Taikiosen boshi keikaku). Text in Japanese. In: Present Status of Pollution and Its Countermeasures, p. 236-256, Sept. 1975.*

The 1971 Clean Air Plan for Osaka was revised and a new 1973 Clean Air Plan was formulated in compliance with the new environmental standards of sulfur oxides, nitrogen dioxide, and oxidant. Data of the 1972 yearly average concentration distributions (compliance rate of environmental standard) of sulfur dioxide, NO2, suspended particulates, carbon monoxide, total hydrocarbons and oxidant were compiled. The target values of pollutant concentrations and target dates were determined based on the emission data of SOx, nitrogen oxides, dust, and HC from stationary and mobile sources. Descriptions of control measures for achieving target values and the basic policy of emission control in Osaka based on the Clean Air Plan are also given.

62627 **APTIC NO. 83873**

Nagasaki Prefectural Government (Japan)

OFFENSIVE ODOR. *(Akushu). Text in Japanese. Nagasakiken Kankyo Hakusho In: Nagasaki Prefectural Environmental White Paper for 1974, p. 102-107, 1975.*

The Nagasaki Prefectural Government has issued reports on offensive odor problems and protective and preventive measures carried out for fiscal year 1974 in its Environmental White Paper. In May 1974, 19 villages and towns were selected as regulated areas under the Offensive Odor Control Law, where prevention of offensive odor will be rigorously pursued. Complaints of malodors generated from animal carcass processing plants are serious, and 28.8% of the environmental complaints are mainly related to malodors from such sources

as the live-stock industry, domestic wastes, the food manufacturing industry and sewage treatment works. Under the offensive odor control law which protects the public health in polluted areas, the following malodorous substances are presently regulated: ammonia, methyl mercaptan, hydrogen sulfide, methyl sulfide, and trimethylamine. Since malodor is closely related to the locality, actual preventive and protective works are delegated to each community by the Prefectural Government who selects the regulated areas and implements the regulation standards.

62628 **APTIC NO. 83874**

Nagasaki Prefectural Government (Japan)

PRESENT STATUS OF ENVIRONMENTAL POLLUTION AND ITS COUNTERMEASURE. *(Kogai no genjo to sono taisaku). Text in Japanese. In: Nagasaki Prefectural Environmental White Paper for 1974. p. 5-40, 1975.*

The Nagasaki Prefectural Government reports the present state and policy for air pollution in its Environmental White Paper for fiscal year 1974. The emission standards for nitrogen oxides were implemented in August, and the regulation for total emission will be adapted for sulfur dioxide in a drastically polluted area in November. Another public announcement was made in January related to the allowable limit for automobile emission gas preceding the 1976 automobile emission gas regulation to be enacted. According to the prefectural air pollution network of monitoring and surveillance, there are 16 continuous automatic monitoring stations, and 42 measuring points for dustfall using the dust jar method, and 45 measuring points for sulfur oxide using the Lead Dioxide Method to survey the environmental air. Sulfur oxides, suspended particulate matter, dustfall, nitrogen oxides, oxidant and carbon monoxide were measured, and tabulated. Nitrogen oxides measured in urban Nagasaki reveal a yearly average of nitrogen dioxide of 0.036 ppm/hr, nitric oxide of 0.033 ppm/hr and 01.2% of the total days measured exceeded the nitric oxide environmental standard.

62629 **APTIC NO. 84154**

Takasago Municipal Office

SUMMARY OF THE ENVIRONMENTAL POLLUTION. *(Kogai no gaikyo). Text in Japanese. p. 1-129, 1975.*

A summary of environmental pollution for the fiscal year 1974 is given. The report is divided into the following major subjects: Environmental Pollution Prevention Policy, Air Pollution Prevention Policy, Water Pollution Prevention Policy, Dredging work at Takasago West Harbor, and Noise/Vibration Prevention Policy. As a result of the dredging work at Takasago West Harbor to dispose of sludge containing mercury and polychlorinated diphenyls (PCB), and of the implementation of the stricter restrictions for the total volume of various contaminating substances to be used in the littoral plants, sulfur oxides air contamination was lowered to the environmental standard, and the concentration of nitrogen oxides and airborne dusts is also declining. There are 5 monitoring stations in the city where continuous automatic measuring of the major air pollutants are performed in addition to the 6 stations where the long range condition of sulfur oxides contamination is analyzed.

62630 **APTIC NO. 84478**

National Oceanic and Atmospheric Administration, Boulder, Colo., Environmental Data Service, Environmental Protection Agency, Washington, D. C., and Environment Canada, Ottawa (Ontario)

PROCEEDINGS OF THE INTERNAL ENVIRONMENTAL INFORMATION WORKSHOP. *(Proc. Int. Environ. Inform. Workshop, Washington, D. C., 1975, 56p. (May 28-30.)*

An environmental information workshop sponsored by the National Oceanic and Atmospheric Administration, the Environmental Protection Agency, and Environment Canada was held to share environmental information and to develop guidelines and procedures for the exchange of data and information resources. Reviews of data and information centers and services are presented along with workshop summaries on public information, library and documentation services, and specialized information and data services.

1974

62631 **APTIC NO. 81769**

Atkinson, Scott E. and Donald H. Lewis

A COST-EFFECTIVENESS ANALYSIS OF ALTERNATIVE AIR QUALITY CONTROL STRATEGIES. *J. Environ. Econ. Manage., 1(3):237-250, Nov. 1974. 25 refs. (Presented at the ORSA/TIMS Meeting, April 1974.)*

A cost-effectiveness analysis of particulate air pollution strategies is presented. An ambient least cost strategy which allocates the control burden on the basis of both individual-source marginal control costs and transfer coefficients derived from individual-source pollutant dispersion characteristics produces the minimum cost solution for achieving ambient air quality standards. Particulate air pollution control strategies of the type included in the State Implementation Plan guidelines are 6-10 times as costly as the ambient least-cost strategy. Emissions least-cost strategies which allocate the control burden only on the basis of marginal control costs without considering the impact of individual transfer coefficients generally enjoy only one-half the cost savings of ambient least-cost strategies over currently enforced State Implementation Plan strategies. The cost of adopting the simplifying assumption that the improvement in regional ambient air quality is proportional to reductions in mass emissions appears to be substantial. The advantage of the least-cost strategies over the SIP strategies may be somewhat reduced by including the cost of controlling minor point sources and area sources which comprise 20% of the regional emissions; however, the effect appears to be negligible. (Author conclusions modified)

62632 **APTIC NO. 81783**

Baliles, Gerald L.

STATE VIEWPOINT. *Natur. Resour. Lawyer, 7(2):193-202, Spring 1974.*

The administration and enforcement of the Clean Air Act is discussed from the state viewpoint. Topics considered include: transportation control strategies, complex and indirect sources, land use planning, and the prevention of significant deterioration. With the advent of indirect source and anti- deterioration regulations, state agencies can no longer contend with only the traditional emission measurement/emission suppression approach which is characteristic of direct source regulations. Abatement of such emissions must now rely to a large extent on politically and socially sensitive land use planning. An additional difficulty is the apparent conflict between the indirect sources and the anti-deterioration regulation. State agencies tend to regulate indirect sources by dispersing them; however, an anti-deterioration regulation may block the moving of indirect sources to areas of cleaner air quality.

62633 **APTIC NO. 81784**

Baum, Robert

FEDERAL VIEWPOINT. *Natur. Resour. Lawyer, 7(2):189-192, Spring 1974.*

The administration and enforcement of the Clean Air Act is discussed from the Environmental Protection Agency s viewpoint. A review of problems associated with the ambient approach to pollution control suggest the need for combining such an approach with a best technology approach. An overriding problem involved in the administration and enforcement of the Act is the degree of change which the public will understand and accept in the process of attaining and maintaining clean air. Problems associated with the acceptance of transportation controls and flue gas scrubber technology are reviewed.

62634 **APTIC NO. 79831**

Boesch, Lawrence, George Kelly, Stephen Noren, Kurt Stehling, and Robert Strieter

AN IMPACT ASSESSMENT OF THREE FEDERAL REGULATIONS (FINAL REPORT). *EcoSystems, Inc., McLean, Va., National Science Foundation Contract NSF-C823, 155p., Oct. 1974. 81 refs.*

NTIS: PB 238 641

The impact of Federal regulatory actions upon regulated industry was studied. The types of regulations studied are automotive emissions, sulfur dioxide emissions for electricity generation, and new drug testing. The discussion of automobile exhaust regulations includes the history of legislation, Clean Air Amendments, and health effects. Derivation of nitrogen oxides, carbon monoxide, and hydrocarbons emission standards are included. Emission controls discussed for internal combustion engines include catalytic converters, carburetors, the Wankel engine, electronic fuel injection, and the stratified charge internal combustion engine. Alternative engines include gas turbine, Rankine, Stirling, electric, and Diesel engines. Alternative fuels and fuel economy are also discussed. Long and short term impacts both beneficial and adverse, are included. The history of state and territorial regulation and national legislation to control sulfur oxides is reviewed, including derivation of the standards. Switching to low sulfur fuel and SO_2 scrubbing are discussed. Government sponsored research includes lime/limestone scrubbers, catalytic oxidation, the Wellman-Lord Process, and double alkali systems. The immediate effects of SO_2 regulation for electricity generation, both beneficial and detrimental, are also discussed. Certain features applied to all the regulatory actions: an aroused public and unintended consequences of the regulations. These features suggest that regulatory actions are often taken hastily. The present policy of punitive measures has not been always successful, due to resentment created in industry. A reluctant industry is not likely to come up with the best solutions; they will look for the path of least resistance. Incentives are recommended. (Author abstract modified)

62635 **APTIC NO. 82086**

Burger, Edward J., Jr.

THE ENVIRONMENT AND THE PROTECTION OF HUMAN HEALTH. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 145-157. 8 refs. (June 24-28.)*

The fundamental motivation behind the study of the effects on human health of environmental agents is the potential opportunity for prevention of disease and disability. This research provides the knowledge base for governmental decisions, and involves many other substances besides air pollutants. Despite the evident opportunity for a preventive endeavor, the body of knowledge available is poor both in quality and quantity and does not correspond to the capacity of science. Some characteristics of this area of investigation which set it apart from others are discussed. The consequences of lack of adequate information for decision-making are examined. Recommendations are made for the improvement of the scientific fabric for regulation. (Author abstract modified)

62636 **APTIC NO. 80215**

Burnham, J. B., M. H. Karr, G. L. Wilfert, W. S. Maynard, S. M. Nealey, G. Jones, I. Jones, B. Gray, N. Parker, J. Coe, and N. Geitner

A TECHNIQUE FOR ENVIRONMENTAL DECISION MAKING USING QUANTIFIED SOCIAL AND AESTHETIC VALUES. *Battelle Pacific Northwest Labs., Richland, Wash., Atomic Energy Commission Contract AT(45-1):1830, 237p., Feb. 1974. 27 refs.*

NTIS: BNWL-1787

Results are presented of an evaluation of social, economic, and environmental tradeoffs in the analysis of nuclear plant siting options. A method was devised for combining social values with technical and economic values. Eight criteria were devised for analyzing nuclear plant options: economics, water quality, air quality, animal and plant life, cultural and recreational, health and safety, aesthetics, and land use. A questionnaire survey was developed using three cooling design options (once-through, natural draft cooling tower, and cooling lake) on each of two sites chosen as test examples. Slides were prepared to aid in describing the aesthetic impacts; one page environmental statements were prepared to describe the other criteria. The survey was administered to 192 respondents in three groups: environmentalists, high school students, and businessmen. The survey was designed to measure the respondents direct weighting of the eight criteria by asking respondents to rank each criterion in order of importance. Analysis of the survey results showed no clear preference for the direct measurement technique over indirect measurements. Two of the criteria, aesthetics and land use, were examined with the goal of deriving a method for quantifying effects. Equations were derived expressing the relationships between viewscape quality and its basic components: intactness, vividness, and unity. The mechanics of making the analysis of a given design on a given site are described. The study of the quantification of land use showed that this criterion was accurately defined by the other seven criteria. (Author abstract modified)

62637 **APTIC NO. 76147**

Burton, C. S. and G. M. Hidy

REGIONAL AIR POLLUTION STUDY PROGRAM. OBJECTIVES AND PLANS (FINAL REPORT). *Rockwell International Corp., Newbury Park, Calif., Air Monitoring Center, Environmental Protection Agency Contract 68-02-1081, Program Element 1AA003, ROAP 26AAI, Task 9, Rept. EPA-650/3-75-009, 92p., Dec. 1974.*

NTIS: PB 247769/AS

The St. Louis Regional Air Pollution Study (RAPS) is described. The immediate goal of the RAPS is the evaluation of existing local and regional scale air quality simulation models. Inherent in this effort is the creation of a comprehensive, accurate, and readily retrievable data base containing emission rates, concentrations of atmospheric pollutants, and pertinent meteorological variables. Pollutants being monitored include: ozone, nitrogen oxides, methane and non-methane hydrocarbons, total sulfur, hydrogen sulfide, sulfur dioxide, and particulates, including sulfates and nitrates. The five basic elements of activity within the RAPS are: model development and evaluation, emission inventories, aerometric measurements, data management, and program management. A detailed description of each of these activities is presented within the context of the program s objectives.

62638 **APTIC NO. 84322**

Caretto, Laurence S.

EVALUATION OF AIR POLLUTION SOURCES. *California Air Environ., 5(1):1-3, Fall 1974.*

Ingredients necessary for an evaluation of air pollution sources in a given area are reviewed. A complete emissions inventory for the area is the first requirement. Additionally, the atmospheric concentrations of pollutants, their air quality standards, the nature and location of the sources, and the meteorology in the region must be known. A typical emissions inventory showing the average statewide emissions of hydrocarbons, particulate matter, nitrogen oxides, sulfur dioxide, and carbon monoxide in tons/day for California during 1972 is illustrated for stationary and mobile sources of pollution.

62639 **APTIC NO. 81786**

Carroll, James C.

INDUSTRY VIEWPOINT. *Natur. Resour. Lawyer, 7(2):203-215, Spring 1974. 31 refs.*

Problems associated with the regulation of the Clean Air Act are discussed from an industry point of view. Fundamental problems contained in the Clean Air Amendments of 1970 include: political pressure which discourages revisions to air quality criteria, the failure of the Clean Air Amendments to define the reasonable time in which secondary ambient air quality standards must be achieved, interference with state flexibility in determining the most cost efficient methods of attaining ambient air quality standards as a result of the Environmental Protection Agency Administrator s power to approve or disapprove implementation plans, disputes regarding the nature of information to be included in implementation plans, failure to provide for an extension of time beyond 2 yr, failure to define the term adequately demonstrated and to provide that a source owner may raise all defenses in a federal enforcement action that he is entitled to raise in a state enforcement action, and the requirement that a source owner must contest virtually every rulemaking action of the Administrator within 30 days of its promulgation. Future air quality control developments are discussed, with particular emphasis on issues which are expected to be litigated.

62640 **APTIC NO. 79272**

Cooper, Norman L.

TRANSPORTATION AND METROPOLITAN AIR QUALITY. *Triangle Univ. Consortium on Air Pollution, N. C., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., American Inst. of Planners, Washington, D. C., American Society of Planning Officials, Chicago, Ill., International City Managers Assoc., Washington, D. C., National Assoc. of Counties, Washington, D. C., Dept. of Housing and Urban Development, Washington, D. C., and Urban Land Inst., Washington, D. C., Natl. Land Use Plann., Transp. Plann., Air Qual. Manage. Conf. Proc., Chapel Hill, N. C., 1974, p. 104-147. 28 refs. (Nov. 13-15.)*

The relationship of transportation and air quality control is discussed. Areas in which transportation and air quality goals are complementary include improved public transportation and energy conservation. It is recommended that amendments to the Clean Air Act allow administrative determination of optimum choices affecting transportation rather than preclude specific strategies. Planning and implementation of transportation control strategies should be accomplished as much as possible by metropolitan areas rather than by larger units. Four categories of transportation control plans are discussed: strategies for reduction of emissions from automobiles already in use, disincentives to low occupancy vehicle use, incentives to high occupancy vehicle use, and other strategies, such as staggered working hr and days. Suitable diffusion models, understanding of the air quality consequences of urban and metropolitan land use patterns, knowledge of the working of discentives, monitoring, and demonstration programs are needed. Department of Transportation activities supportive of air quality include the Metropolitan Transportation Planning Process, parts of the Federal-Aid Highway Program, the Urban Mass Transportation Program, programs to encourage carpool activity, automotive and aircraft emission control programs, and a research program related to air quality management. Integration of air quality programs and transportation programs should be accomplished for the many instances where air quality goals and transportation goals are complementary.

62641 **APTIC NO. 83216**

Fugash, Mirka

REVIEW OF ACTIVITIES IN AIR POLLUTION PREVENTION IN YUGOSLAVIA. *(Pregled Aktivnosti na podrucju sprecavanja oneciscenja zraka u Jugoslaviji). Text in Serbo-Croatian. Arhiv. Hig. Rada. Toksikol. (Yugoslavia), 25(4):499-501, 1974.*

The struggle for clean air in Yugoslavia is reviewed. Various federal, state, and local laws have been passed since 1965 whose objective is to keep toxic elements (especially sulfur dioxide) at a low level. The Yugoslav Society for Clean Air was founded in 1973, and the first issue of a scientific journal called Protection of the Atmosphere has already been published.

62642 **APTIC NO. 79236**

Hagevik, George

INFORMATION REQUIREMENTS OF LAND USE PLANNERS CONCERNED WITH AIR QUALITY MANAGEMENT: HOW THE PLANNER CAN BREATHE EASIER. *Triangle Univ. Consortium on Air Pollution, N. C., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., American Inst. of Planners, Washington, D. C., American Society of Planning Officials, Chicago, Ill., International City Managers Assoc., Washington, D. C., National Assoc. of Counties, Washington, D. C. Dept. of Housing and Urban Development, Washington D. C., and Urban Land Inst., Washington, D. C., Natl. Land Use Plann., Transp. Plann., Air Qual. Manage. Conf. Proc., Chapel Hill, N. C., 1974, p. 151-163. 6 refs. (Nov. 13-15.)*

Environmental data needs of land use planners are discussed. Air quality data need to be in a form understandable and usable by decision makers in general purpose units of government. The form must also respond to requirements of a continuing plan implementation process. The air quality management process will require differing types and amounts of data depending on the level of government involved. A data requirements framework is described. Information input that land use planners need from air quality managers is discussed. Required input from state agencies and the Environmental Protection Agency include the equity issue, relating wastewater management to air quality management, a clearinghouse for planner s problems, tradeoffs between technological and institutional and social controls, emission factors, and the overall framework for air quality management. Needs from regional agencies include explanation of consistency of plans and air quality modeling, the assimilative capacity of the region, the relationship of air quality maintenance planning to comprehensive planning, a realistic time frame for implementing an emission allocation procedure, the relationship of land use decisions to transportation decisions, and techniques to monitor progress of plan implementation. Local agencies should tell planners how to develop consistency with regional plans, calculate the air quality implications of local land use plans, resolve conflicts over division of the allowable emissions, introduce air quality considerations into land use recommendations, and get support for difficult decisions.

62643 **APTIC NO. 70622**

Harlow, Robert L.

CONFLICT REDUCTION IN ENVIRONMENTAL POLICY. *J. Conflict Resolut., 18(3):536-552, Sept. 1974. 23 refs.*

The possible merit of substituting market for administrative controls in reducing environmental pollution is discussed. Two alternative proposals are considered: the pollution tax, a fee for each unit of discharge into a particular environmental medium (e.g., air) and a pollution license, a lump sum pollution tax per unit of discharge. These market or price system techniques have the potential for stimulating production and consumption, and for efficiency and reducing the administrative burdens on the political system. By forcing polluters to pay for damage, damage is reduced because less-polluting technologies become more attractive economically. Two difficulties envisioned with such market or price schemes involve the need for accurate pollution price or license quantity setting and the temptation on the part of governments to use taxes or license receipts for general revenue.

62644 **APTIC NO. 79269**

Hart, Fred C.

AIR QUALITY MANAGEMENT USING LAND USE AND TRANSPORTATION PLANNING AND CONTROLS. *Triangle Univ. Consortium on Air Pollution, N. C., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., American Inst. of Planners, Washington, D. C., American Society of Planning Officials, Chicago, Ill., International City Managers Assoc., Washington, D. C., National Assoc. of Counties, Washington, D. C., Dept. of Housing and Urban Development, Washington, D. C., and Urban Land Inst., Washington, D. C., Natl. Land Use Plann., Transp. Plann., Air Qual. Manage. Conf. Proc., Chapel Hill, N. C., 1974, p. 65-80. (Nov. 13-15.)*

Operation of New York City s air management program, which emphasizes land use and transportation controls, is discussed. The program had a large staff from 1970 to 1973 and the accomplishments were dramatic. Then, a change in administration occurred, the staff was reduced, and signs point to retreat from the progress previously made. This type of experience and disputes between environmental agencies and transportation and city planning agencies commonly occur in state and local government. Local and state air quality programs should include transportation and land use planners in their own staffs. The present parking strategy in New York City is an example of poor planning. It was decided to decrease the number of parking spaces in the central business district in Manhattan to discourage bringing cars into the area. Three different plans were developed by the City and State Environmental Protection Agencies and the City Planning Commission. Lack of good data was a problem in this and many other programs. The location, causes, and means of correcting the problem can be determined with a solid data base. Traffic management is underestimated as a way to control transportation-related pollution. Changing the zoning laws is recommended to control pollution levels, because zoning controls population density and the location of industry. The problems of urban sprawl and open space are discussed. A national land use law is recommended.

62645 **APTIC NO. 84373**

Haythorne, Robert E. and James W. Rankin

VISUAL PLUME READINGS - TOO CRUDE FOR CLEAN AIR LAWS. *Natur. Resour. Lawyer, 7(3):457-478, Summer 1974. 64 refs.*

The adequacy and accuracy of visual plume observations and the legality of using plume opacity limits in air pollution regulations are questioned. Eyeball plume readings cannot be made with sufficient precision since the human eye cannot reliably distinguish opacity differences less than 5%. Moreover, opacity is not an adequate measure of the amount of pollution the plume contains since variations in stack diameter, gas velocity, particle size, moisture content, or light conditions can cause plumes to exhibit different opacities even though they contain the same weight of pollutants. Anti-pollution regulations which are violated by exceeding an opacity limit create a conclusive presumption that the degree of opacity is irrebuttable proof of the degree of pollution. A review of similar legislative action which has been struck down by the Supreme Court is presented.

62646 **APTIC NO. 76434**

Heitner, Kenneth and James E. Krier

OUTLINE OF AN APPROACH TO MANAGEMENT STANDARDS. *California Inst. of Tech., Pasadena, Environmental Quality Lab., National Science Foundation Grant GI-29726, Rept. EQL-13, 17p., Jan. 1974.*

The application of management standards to air quality control on a nationwide basis is discussed. Topics discussed include: the promulgation of uniform National Primary Ambient Standards, the designation of regional classifications, the promulgation of management standards, the submission of State Implementation Plans, case-by-case negotiation of specific regional air pollution problems, replanning procedures to adjust for changes in technology and economic conditions, inducements for planning procedures, and the promulgation of secondary ambient standards. Management standards are seen as aiming at long-term goals while insisting on short-term, time-phased improvements in air quality.

62647 **APTIC NO. 79687**

Higginson, N.

USE OF DIESEL ENGINES UNDERGROUND IN BRITISH COAL MINES. *In: Proceedings of the Symposium on the Use of Diesel-Powered Equipment in Underground Mining, Pittsburgh, Pa., Jan. 30-31, 1973. Bureau of Mines Information Circ., no. 8666:276-323, 1974.*

The introduction and growth of the diesel powered vehicles operating underground in British coal mines are reviewed. The major requirements of the law relating to safety and health are defined and the methods of sampling and analyzing exhaust gases and mine air are described. These provide a means of controlling existing applications and assist in the planning of future installations of diesel powered locomotives and vehicles. The potential hazards associated with the diesel engine are described. A summary of safety records since the nationalization of British mines in January 1974 is included. The design criteria of the disesl engine and its associated ancillary equipment are discussed and an average cost analysis is included. (Author summary modified)

62648 **APTIC NO. 81830**

Holling, C. S., J. Steele, J. Jeffers, J. Rabinovich, G. Gallopin, J. Gross, and Y. Shimazu

MODELLING AND SIMULATION FOR ENVIRONMENTAL IMPACT ANALYSIS. *International Inst. for Applied Systems Analysis, Laxenburg (Austria), Rept. RM-74-4, 56p., Feb. 1974. 4 refs.*

Guidelines for the use of models and simulation techniques in the asessment of environmental impacts are presented. Topics covered include: criteria for using models, initial variable identification and organization, the assignment of degrees of precision, the development of impact indicators, the development of policy and management actions, linear and non-linear models, static and dynamic models, predictive and decision making models, model validation, the use of model outputs in a complex policy analysis, and training programs involving techniques of environmental impact assessment.

62649 **APTIC NO. 81945**

Horowitz, Joel and Steven Kuhrtz

TRANSPORTATION CONTROLS TO REDUCE AUTOMOBILE USE AND IMPROVE AIR QUALITY IN CITIES. THE NEED, THE OPTIONS, AND EFFECTS ON URBAN ACTIVITY. *Environmental Protection Agency, Washington, D. C., Office of Air and Waste Management, Rept. EPA-400/11-74-002, 69p., Nov. 1974. 85 refs.*

Environmental Protection Agency (EPA) programs to achieve air quality standards for carbon monoxide and oxidants are discussed. The EPA is authorized to establish emissions standards for automobiles, trucks, and motorcycles. States must develop implementation plans for attaining and maintaining air quality standards. New car standards and stationary source emissions reductions will not achieve air quality standards in all parts of the country. The affected states must submit transportation control plans to reduce automobile emissions in regions expected to exceed oxidant or CO standards in 1975. Transportation control measures include measures reducing emissions from individual vehicles and measures reducing automobile use. The EPA promulgated transportation control measures for some regions. A proposed Clean Air Act ammendment would provide additional flexibility in deadlines for regions unlikely to achieve the standards by 1977 without ex-

treme measures. Frequent measures for reducing automobile use are transit improvements, carpooling programs, priority treatment for buses and carpools, and parking restrictions. Parking surcharges were considered but later withdrawn. Programs combining transit improvements, carpool incentives, and parking restrictions or charges can reduce automobile emissions by as much as 30%. Reductions in automobile use resulting from transportation controls will also alleviate other urban transportation problems. However, increased use of transit instead of cars is likely to increase travel times. Parking restrictions or surcharges can serious restrict mobility if adequate transit or carpool device is not provided. Many Department of Transportation policies and programs support measures in the transportation control plans. Each agency s program can benefit from that of the other. (Author abstract modified)

62650 **APTIC NO. 79812**

Krier, James E.

THE IRRATIONAL NATIONAL AIR QUALITY STANDARDS: MACRO- AND MICRO-MISTAKES. *UCLA Law Rev., 22(1):323-342, Oct. 1974. 61 refs.*

A test is outlined for judging the rationality of types of air pollution control, and is applied to uniform air quality standards. Objections to the test are discussed. The Environmental Protection Agency s proposal for rationing gasoline in Los Angeles is considered. It is recommended that the law be changed to provide for uniform federal standards, to provide for states to set more stringent standards, and to further provide for states to set less stringent standards for particular regions upon demonstrating that the tighter standards would be too costly to achieve. (Author abstract modified)

62651 **APTIC NO. 82448**

Kugel, G.

SPECIAL PLANNING REQUIREMENTS (LOCATION, GROUND PLAN, AUTOMATION, SAFETY). *(Spezielle Erfordernisse bei der Entwurfgestaltung (Standort, Lageplan, Automation, Sicherheit)). Text in German. Ber. Abwassertech. Ver.), (27):123-204, 1974. 16 refs.*

Problems of site selection, automation, safety and reliability in connection with the planning of municipal wastewater treatment plants are described. Due to inevitable malodorous and noise emissions, wastewater treatment plants should be established beyond the limits of communities. A safety distance of 200 m is recommended between residential areas and wastewater treatment plants designed for up to 100,000 inhabitant equivalent, and this distance should be at least 300 m for plants with larger capacity. Sewage sludge should be hauled off regularly in closed containers to avoid malodorous emissions.

62652 **APTIC NO. 82186**

Lauer, George and Ferris B. Benson

THE CHAMP AIR QUALITY MONITORING PROGRAM. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 423-430. (June 24-28.)*

The Community Health Air Monitoring Program (CHAMP) system has been designed to obtain short term, as well as long term, air monitoring data to assess the influence of pollutants on the health of five communities in the United States. The philosophy of design is discussed with an emphasis on the techniques and methodology utilized to insure that the data obtained are valid. The aerometric sensor calibration subsystem is included. Program requirements, both present and anticipated, are presented and the system as it now exists is described. (Author abstract modified)

62653 **APTIC NO. 76306**

Liberti, Arnaldo

LABORATORY FOR AIR POLLUTION STUDIES, ROME; SCIENTIFIC ACTIVITY IN 1973. *(Laboratorio sull inquinamento atmosferico, Roma; attivita scientifica svolta nel 1973). Text in Italian. Ric. Sci., 44(5):750-754, Sept.-Oct. 1974. 21 refs.*

The coordinating center for the research projects of the European Economic Community (CCE) on the chemical and physical properties of sulfur dioxide in the atmosphere is described. It is participating in a group of studies on the standardization of analytical and control methods. The Stazione Pilota, located near the Laboratory, is participating in the project of the Organizzazione Mondiale della Sanita (WHO, Geneva) to evaluate pollution in Rome by collecting samples of sulfur dioxide and particulate matter from three areas of the city which represent residential, commercial, and suburban environments. One project is trying to determine the influence of pollutant transport from distant sources. Much time is being devoted to gathering information on the effects of air pollution on school students; SAPCRN apparati were distributed to more than 100 schools to survey sulfur dioxide and particulate matter. Gas chromatographic methods are used for the continuous determination of hydrocarbons and methane in the air, the analysis of carbon monoxide, the determination of sulfur compounds, the determination of polynuclear hydrocarbons extracted from particulate matter by means of mass gas chromatography spectrometry, and the determination of azaheterocyclic compounds and alkanes in particulate matter; the technology for micropacked columns is also being researched. The Laboratory is studying the interaction between sulfur dioxide and particulate matter in the atmosphere. Research devoted to electrodes is focused, on the one hand, on membrane composition and preparation, and, on the other hand, on the resolution of analytical problems related to the measure of certain pollutants.

62654 **APTIC NO. 79234**

Macleod, Scott

FINANCING ENVIRONMENTAL MEASURES IN DEVELOPING COUNTRIES: THE PRINCIPLE OF ADDITIONALITY. *International Union for Conservation of Nature and Natural Resources, Morges (Switzerland), IUCN Environmental Policy and Law Paper 6, 55p., 1974. 40 refs.*

The meaning and application of the principle of additionality are discussed. According to this principle, incremental costs arising from the incorporation of environmental measures in development projects should be met by additional funding. The long term benefits of environmental action must also be considered. The United Nations Environment Programme Fund is described.

62655 **APTIC NO. 79237**

Mandelker, Daniel R.

THE CLEAN AIR ACT: LAND USE AND TRANSPORTATION IMPLICATIONS. *Triangle Univ. Consortium on Air Pollution, N. C., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., American Inst. of Planners, Washington, D. C., American Society of Planning Officials, Chicago, Ill., International City Managers Assoc., Washington, D. C., National Assoc. of Counties, Washington, D. C., Dept. of Housing and Urban Development, Washington, D. C., and Urban Land Inst., Washington, D. C., Natl. Land Use Plann., Transp. Plann., Air Qual. Manage. Conf. Proc., Chapel Hill, N. C., 1974, p. 5-15. 12 refs. (Nov. 13-15.)*

The provisions of the Clean Air Act that bear on the implementation of land use and transportation controls are reviewed, along with court decisions that have construed the provisions of the Act authorizing or at least contemplating those controls, and the administrative steps that the Environ-

mental Protection Agency has so far taken to make these controls effective. Transportation controls initially proposed by EPA included stringent controls on parking facilities, including the imposition of substantial parking fees on commuters; the encouragement of carpooling and similar techniques to reduce motor vehicle use; and local measures limiting motor vehicle traffic which were aimed at encouraging the use of public transporation. The EPA was at first slow to move in the area of land use controls. Judicial decisions involved the role of EPA in maintaining as well as achieving the national standards, the nondegradation policy, and the authority of EPA to extend time deadlines for meeting the requirements imposed by the Act. As part of a settlement negotiated in litigation, EPA agreed to impose controls over indirect as well as direct sources of air pollution. The EPA has modified its guidelines and requirements to implement these several court decisions. Regulations have been promulgated requiring the preparation of air quality maintenance plans for air quality in which maintenance problems are serious. Policy issues presented by the land use and transportation control requirements are discussed.

62656 **APTIC NO. 79267**

Miller, John M., (ed.)

GEOPHYSICAL MONITORING FOR CLIMATIC CHANGE NO. 2 SUMMARY REPORT -- 1973. *National Oceanic and Atmospheric Administration, Washington, D. C., Environmental Research Labs., 104p., 1974. 12 refs.*

The Geophysical Monitoring for Climatic Change program objectives involve collection of accurate observations of atmospheric trace constituents. The major physical changes within the observatory network occurred with the completion of the total ozone observational dome at Point Barrow (Dobson spectrophotometer facilities), the preparatory design work for major additions to the South Pole program during the 1973-74 austral summer, and the construction of a sampling tower at Samoa The programs at the observatories were augmented to include an increase in more sensitive aerosol data, surface ozone instrumentation, sampling for freon and carbon tetrachloride, and inauguration of precipitation collection for chemical analyses at Mauna Loa, Samoa, and Point Barrow. The largest advance was at Point Barrow with the start of continuous observations of Aitken nuclei, surface ozone, carbon dioxide, and a schedule of total ozone determinations. Lidar was used to interpret aerosol data collected by other observatory instruments. Instrumentation and calibration equipment for measuring solar radiation is described. The Mauna Loa Observatory has begun to monitor daily and seasonal variations in surface carbon monoxide concentrations and to establish possible trends, under a cooperative program with the Max Planck Institute, Mainz, Germany. (Author abstract modified)

62657 **APTIC NO. 73361**

Muramatsu, S.

THE ACTUAL CONDITION OF THE ENVIRONMENTAL SANITATION IN THE BUILDING FROM THE VIEWPOINT OF LAW CONCERNING CONSERVATION OF SANITARY ENVIRONMENT IN BUILDING. *(Biru kanriho kara mita biru kankyo no genjo). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 12(2):2-13, July 1974.*

The law concerning Conservation of Sanitary Environment in Building was issued in 1970. Special buildings subject to monitoring by the law are office buildings, schools, department stores, hotels, museums, art galleries, and libraries with a gross floor area of more than 5000 sq m. Thee law gives specific instructions on atmospheric environment measurements and ventilation facilities. Indoor environmental conditions including airborne particulates, carbon monoxide, carbon dioxide, temperature, relative humidity, air flow, bacterial number, and illumination, and outdoor environmental conditions including airborne particulates, carbon monoxide, temperature, relative humidity, and other gases must be measured periodically. Airborne particulates, CO, and CO2 concentrations must be measured three times a day at 10:00-12:00, 13:00-15:00 and 15:00-17:00, and the average values are used as daily averages. Other harmful gases in buildings also must be checked if necessary.

62658 **APTIC NO. 79235**

Roberts, John J.

DATA REQUIREMENTS FOR THE DESIGN AND IMPLEMENTATION OF STRATEGIES FOR MAINTENANCE OF CLEAN AIR GOALS. *Triangle Univ. Consortium on Air Pollution, Dept. of Transportation, Environmental Protection Agency, American Inst. of Planners, American Society of Planning Officials, International City Managers Assoc., National Assoc. of Counties, Dept. of Housing and Urban Development, and Urban Land Inst., Natl. Conf. Land Use Plann., Transp. Plann. Air Qual. Manage. Conf. Proc., Chapel Hill, N. C., 1974. P. 184-196. 2 refs. (Nov. 13-15.)*

The data requirements at each major stage of the regulatory process are discussed. A data matrix summarizes the principal steps in the air quality management process and the associated data requirements. The columns of this matrix present the air quality maintenance problem as one of definition, quantification, and design and implementation of control strategies. The matrix further identifies the most likely source of each data element. Quantification of the maintenance problem requires forecasting of emissions and associated air pollution levels in 1980 and 1985. Analysis of the current air quality situation is necessary and typically involves the application of dispersion models relying on inputs of air quality data and a current emission inventory. A policy of nonsignificant deterioration has been proposed. Four basic strategies are considered: source controls, indirect source reviews, emission density zoning, and explicit limits on regional or subregional growth.

62659 **APTIC NO. 79271**

Schofer, Joseph L.

TRANSPORTATION POLICY AND AIR QUALITY MANAGEMENT: SOME CURRENT PERSPECTIVES. *Triangle Univ. Consortium on Air Pollution, N. C., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., American Inst. of Planners, Washington, D. C., American Society of Planning Officials, Chicago, Ill., International City Managers Assoc., Washington, D. C., National Assoc. of Counties, Washington, D. C., Dept. of Housing and Urban Development, Washington, D. C., and Urban Land Inst., Washington, D. C., Natl. Land Use Plann., Transp. Plann., Air Qual. Manage. Conf. Proc., Chapel Hill, N. C., 1974, p. 27-41. 19 refs. (Nov. 13-15.)*

Transportation responses to air quality problems typically include vehicle emissions reductions through technical improvements, maintenance, and inspections; traffic flow improvements; and reduction in vehicle miles of travel in urban areas. Reductions in VMT might be achieved through reduction of demand for travel and shifting to more efficient modes. The preferred strategy is modal shifts. The complete effects of transportation changes on accessibility, mobility, land values, land use, and the quality of urban life are not known. Transportation planning has tended to extrapolate the present into the future. Federal funding for Interstate freeways in cities has encouraged auto dependent travel. Freeway investments to cope with increasing congestion is an example of the extrapolative approach. The Highway Act of 1973 changes the situation slightly, allowing local governments to allocate Federal highway funds to transit. There is a tendency to keep existing services, when air quality concerns might lead to different transit investments. Urban transport funds are not necessarily being allocated so as to help meet Clean Air standards. Implementation depends on the impacts of alternatives. The impacts of particular options should be studied through large scale, Federally sponsored, experiments. Another requisite is a responsive planning process and component methodologies. There has been a tendency to accumulate Federal procedural requirements. The processes used in implementation planning are methodologically weak and unresponsive to transportation planning procedures and requirements, and fail to treat serious, long term implications.

62660 **APTIC NO. 79296**

Schroeder, Stanley W.

LEGAL ASPECTS OF ODOR CONTROL. *In: Industrial Odor Technology Assessment. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 31, p. 469-486. 10 refs.*

The legal aspects of odor control are reviewed against the historical background of the common law of nuisance. Topics covered include: statutes based on the law of nuisance and their limitations, general problems of litigation, statutory laws to control odors, the development of a model odor ordinance, odor measurement and evaluation procedures, and problems of legal forecasting. A checklist for the legal evaluation of an odor situation is also provided.

62661 **APTIC NO. 79268**

Schueneman, Jean

FEDERAL, STATE, AND LOCAL AIR QUALITY MANAGEMENT PROGRAMS: TRANSPORTATION AND LAND USE IMPLICATIONS. *Triangle Univ. Consortium on Air Pollution, N. C., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., American Inst. of Planners, Washington, D. C., American Society of Planning Officials, Chicago, Ill., International City Managers Assoc., Washington, D. C., National Assoc. of Counties, Washington, D. C., Dept. of Housing and Urban Development, Washington, D. C., and Urban Land Inst., Washington, D. C., Natl. Land Use Plann., Transp. Plann., Air Qual. Manage. Conf. Proc., Chapel Hill, N. C., 1974, p. 81-103. (Nov. 13-15.)*

The history of air pollution control is discussed. Most of the state and local governmental air pollution control programs today are molded to reflect the requirements of the Federal Clean Air Act of 1970. The basic foundation of the national program is the ambient air quality standards established by the Federal Government. The other key element of the Act is a requirement that all states must develop and implement plans to achieve and maintain the air quality standards by a specific date. Air quality maintenance plans for 1975 to 1985 will involve evaluation of the air quality implications of future land use development, pollutant source emissions, and transportation patterns. Once this evaluation is made, it will be necessary to develop an enforceable plan to insure that air quality standards are maintained. Key elements in the relationship between air resource management and transportation and land use are briefly discussed. Air quality control agencies will have to integrate and coordinate their plans with those of other organizations. Several difficult issues involving air quality control and community planning are discussed.

62662 **APTIC NO. 82089**

Syrota, Kneip, Vouk, Bravo, Pham, English, Wesolowski, Sherwood, and Steensberg

PANEL DISCUSSION. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 459-473. (June 24-28.)*

Methods of measuring human exposure to air pollutants are discussed. There is, at present, no standard method of measurement for even the most common pollutants. Carefully planned efforts with well-defined objectives may be carried out quite well by a small group; such a group found that along with the reduction of lead in air, there is a reduction of lead in lung tissue of urban dwellers. Obviously, levels of air pollutants should not be identified with the true exposure of an individual or population group. The validity of suspended particulates data from a network in Latin America is questioned, because the measurement method used is based on a standard smoke curve developed in England where coal heating is much more common. The method is considered good enough because the purpose of the network was not to obtain absolute values for suspended particulate matter but to follow trends. The cost and the personnel requirements for a measuring network are discussed. The regional air pollution study in St. Louis, which is described, cost 5 million dollars/yr for 5 yr. Use of an isopleth model is discussed. Personal environmental monitors are needed. A program in the U. S. compares health effects in otherwise similar communities with high, moderate, and low pollutant concentrations. Particulate sulfates seem to correlate better than sulfur dioxide and total suspended particulates with health effects. However, a satisfactory method has not yet been developed for measuring them. The mathematical correlation also does not prove that sulfate is affecting human health although it may be an index or an indicator.

62663 **APTIC NO. 81785**

Terris, Bruce J.

ENVIRONMENTAL CRITIQUE. *Natur. Resour. Lawyer, 7(2):217-221, Spring 1974.*

A critical analysis of the Environmental Protection Agency's enforcement of the Clean Air Act is presented, with particulate emphasis on the requirement of no significant deterioration. Possible approaches being considered by the EPA to meet the requirements of the no significant deterioration principle assume that the Act applies only to particulates and sulfur oxides. Furthermore, the approaches deal only with huge stationary sources which emit over 4000 tons of pollution per year and do not prevent deterioration from other large sources or even the largest complex sources. The establishment of how many micrograms of each pollutant can be added per cubic meter of air and the application of the standard to all pollutants, all substantial sources, and every area of the country is suggested as an effective way to prohibit significant deterioration.

62664 **APTIC NO. 81799**

Thompson, Mark

A STUDY OF RESEARCH AND DEVELOPMENT IN ENVIRONMENTAL ENGINEERING USING SYSTEM APPROACH. *International Inst. for Applied Systems Analysis, Laxenburg (Austria), 57p., Aug. 1974. (Presented at the UNESCO Expert Meeting on Environmental Engineering, Jan. 1974.)*

A systems approach for the redirection of environmental management and research is presented. Models of the encompassing social system as it affects the environment are presented and include: a micro-economic view of the firms and households which may pollute the environment, the basic political mechanisms through which environmental assaults can be controlled, and the network of information flows necessary to manage the environment. Specific topics covered include: the availability of environmental monitoring feedback information, setting and maintaining standards, emergency preparation, environmental management, and the effects of incentives on policy options.

62665 **APTIC NO. 76205**

Wafelman, H. R.

METHODS FOR EMISSION MEASUREMENTS IN HOLLAND. *(Erfahrungen mit Messmethoden fuer Immissionsmessungen in Holland). Text in German. Neue Tech., 16(8):309-313, 1974.*

The air quality monitoring networks set up in the Netherlands are described. The national network of 250 sampling stations for the semicontinuous measurement of the sulfur dioxide concentrations by electrochemical methods is connected to a computer center in Bilthoven via telephone lines. The photochemical smog event in the fall of 1971 prompted the establishment of a regional monitoring network composed of six stationary and four mobile stations for the measurement of other air pollutants in southern Holland. The TNO-Airmonitor, developed for use in this regional network, is suitable for the colorimetric determination of nitrogen dioxide, nitric oxide, sulfur dioxide, ozone, and chlorine. A special fully automatic chromatograph has been developed for the determination of methane, ethane, ethylene, acetylene, propane, propene, n-butane, isobutane, hydrogen sulfide, carbon disulfide, SO2, and mercaptans, using catalytically purified and dried air as carrier gas. The regional network is connected to the computer center of the national network. A simple data processing system using magnetic tapes is also available.

62666 **APTIC NO. 79270**

Watt, Paul C. and Wayne Hoffman

AN EXPERIENCE IN RELATING TRANSPORTATION, LAND USE, AND AIR QUALITY PLANNING. *Triangle Univ. Consortium on Air Pollution, N. C., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., American Inst. of Planners, Washington, D. C., American Society of Planning Officials, Chicago, Ill., International City Managers Assoc., Washington, D. C., National Assoc. of Counties, Washington, D. C., Dept. of Housing and Urban Development, Washington, D. C., and Urban Land Inst., Washington, D. C., Natl. Land Use Plann., Transp. Plann., Air Qual. Manage. Conf. Proc., Chapel Hill, N. C., 1974, p. 43-64. (Nov. 13-15.)*

The trends in land use and transportation planning show an institutional gap in decision making and a technical gap in terms of integrating the planning processes. The planning organizations in the Bay area are described. The Metropolitan Transportation Commission, which is involved with comprehensive planning as it relates to transportation, has an agreement with the Association of Bay Area Governments to cooperate on land use planning. Agreements are also being worked out between other agencies and ABAG. The MTC is working closely with the Bay Area Air Pollution Control District on problems that involve air pollution. A concise and simplified process for interrelating land use, transportation, and air quality planning is presented. Input to project evaluation should include the project description and analytical data; environmental impact reports; policy guidance on land use, transportation, and air quality; land use data, demographic data, and traffic data from regional or local agencies; and computer analysis and modeling. Use of the process with a land use project or plan as the central theme could be easily accomplished, although any change in application of the process would necessitate a change in the emphasis and relevance of various inputs. The establishment of joint resolutions, work programs and committees is a must for the successful implementation of coordinated land use, transportation, and air quality planning.

62667 **APTIC NO. 81835**

Werczberger, Elia

A MIXED-INTEGER PROGRAMMING MODEL FOR THE INTEGRATION OF AIR- QUALITY POLICY INTO LAND-USE PLANNING. *Pap. Reg. Sci. Assoc., vol. 33:141-154, 1974. 6 refs. (Presented at the European Congress of the Regional Science Assocation, 13th.)*

A mixed-integer programming model for the integration of air quality policy into land use planning is presented. Air quality policy is introduced by requiring for each urban activity maintenance of the appropriate air quality objective at the site at which a unit of the activity is located. The consideration of zoning regulations and of spatially differentiated air quality objectives results in a mixed-integer programming model. A hypothetical example involving sulfur dioxide pollution is evaluated for a situation which includes the activities of housing, light industry, and a power plant.

62668 **APTIC NO. 82862**

Yamamoto, Nobuyuki

ON FUNDAMENTAL EXPANSION OF PREVIOUS SYNTHETIC INVESTIGATIONS CONCERNING INDUSTRIAL PUBLIC HAZARD. *(Sangyo kogai sogo jizen chosa no bapponteki kakuju ni tsuite). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 3(8):20-24, July 1974.*

Previous synthetic investigations were aimed at the prevention of industrial public hazards stemming from the installation of factories by utilizing information about plans for the installation or expansion of factories in areas in which large-scale factories are concentrated. These synthetic investigations were begun when the factory-installation law was passed. This law was a revision of part of the previous law concerning investigations into the installation of factories passed on October 1, 1973. It consisted of three parts: the Ministry of International Trade and Industry (MITI) must draw up a register of investigations into the installation of factories by following current practices in the installation of factories offered for industry inspection; and MITI and jurisdiction ministers will make public working rules relating to ratios of production facilities, green areas, and environmental facilities to the whole factory site. The deliberation body on the installation of factories and industrial water held the first public hazard session on May 23, 1974, in which areas covered by the previous synthetic investigations, investigative methods, and enforcement systems were decided upon.

62669 **APTIC NO. 79297**

Young, Richard A. and Harry A. Young

ODOR CONTROL CASE LAW. *In: Industrial Odor Technology Assessment. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 32, p. 487-493.*

Legislation dealing with odorous air pollution is reviewed, with three particular cases being cited to illustrate the principles involved in present laws regulating odors and some of the problems encountered in regulating odors. The first case illustrates the law of nuisance which provides for the awarding of money to a person if his reasonable comfort and enjoyment are disturbed by odor nuisances. The second case which is based on the principles of fairness and equity and without the sanction of a statute or ordinance illustrates that a permanent injunction can be used to close a facility causing an odor problem. The third case constitutes the old common law standards of annoyance, comfort, and quiet enjoyment in a statute and a court s finding of a violation of that statute involving noxious odors.

62670 **APTIC NO. 79608**

Zakhidov, A. Z., S. T. Atabaev, and I. I. Illinskiy

PRINCIPAL ACHIEVEMENTS IN ENVIRONMENTAL PROTECTION IN THE UZBEK SSR. *(Osnovnye uspekhi v oblasti okhrany i ozdorovleniya vneshney sredy v Uzbekskoy SSR). Text in Russian. Med. Zh. Uzbekistana, no. 10:12-15, Oct. 1974.*

A status report on environmental pollution and on measures taken to control it in the Uzbek SSR is presented. Legislative measures have been taken for the protection of public health, water, and concerning land use. There have been episodes of high morbidity due to high air pollution levels. The air pollution levels show an upward trend in certain towns and areas with large industrial plants, which is due to faulty or incomplete implementation of the necessary technological and hygienic measures.

62671 **APTIC NO. 73410**

Toyonaka Municipal Office (Japan) Environmental Pollution Control Office

ORDINANCES FOR ENVIRONMENTAL CONSERVATION IN TOYONAKA CITY, AND THEIR ENFORCEMENT PROVISIONS. *(Toyonaka-shi kankyo hozen jorei; Toyonaka-shi kankyo hozen jorei shiko kisoku). Text in Japanese. 63p., 1974.*

The text of regulations and enforcement provisions promulgated by Toyonaka City, Japan in 1973 and 1974 for environmental conservation is contained in this booklet. The duties and responsibilities of businesses, thee mayor, and citizens are listed Rules are spelled out for control of factories; construction; sunshine blockage; vacant lots; trees and woods; noise (loudspeakers, airplanes); air, water, and soil pollution; and land use.

62672 **APTIC NO. 73411**

Suita Municipal Government (Japan), Council for Environmental Pollution Control

COMMITTEE RECOMMENDATION ON THE ENVIRONMENTAL POLLUTION CONTROL PROGRAM IN SUITA CITY. *(Toshinsho: Suita-shi kogai boshi keikaku no arikata). Text in Japanese. 108p., 1974.*

Long-range plans (10 years, starting in 1974) for improving the environmental quality of Suita City, Japan, are outlined. Pollution control plans for Suita City are based on Osaka Prefectural Environmental Control Plans. Some goals are to be attained in 1977, 1979, and 1981. Areas of control include: atmospheric pollution, including malodors; water cleanup; prevention of ground sinking due to removal of subterranean water; prevention of soil contamination; and noise and vibration control. Maintenance of environmental quality where there has been little deterioration so far is also a goal. The atmospheric pollution in Suita City is influenced by occurrences in Osaka City and Amazaki City, so further meteorological studies are necessary.

62673 **APTIC NO. 75968**

Environmental Services of TRW, Inc., Vienna, Va., Environmental Protection Agency, New York, Region II and Office of Air and Waste Management, Research Triangle Park, N. C.

IMPLEMENTATION PLAN REVIEW FOR PUERTO RICO AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Office of Air and Waste Management Contract 68-02-1385, Rept. EPA-450/3-74-070, 47p., Dec. 1974. 10 refs.*

NTIS: PB 244914/AS

A review of Puerto Rico s state implementation plan as required by the Energy Supply and Environmental Coordination Act of 1974 is presented as part of an effort to determine if revisions to control regulations for stationary fuel combustion sources can be made without interfering with the attainment and maintenance of the National Ambient Air Quality Standards for sulfur dioxide and total suspended particulates. Although little possibility currently exists for revising the total suspended particulate source regulations, potential does exist for revising the SO2 source regulations. Most of Puerto Rico s SO2 emissions emanate from major point sources such as power plants. Puerto Rico is in the process of revising its sulfur-in-fuel regulations using a source-by-source diffusion modeling analysis to determine the optimum sulfur content of fuel that allows for the attainment of NAAQS locally.

62674 **APTIC NO. 75969**

Environmental Protection Agency, Chicago, Ill., Regional Office V and Argonne National Lab., Argonne, Ill., Energy and Environmental Systems Div.

IMPLEMENTATION PLAN REVIEW FOR OHIO AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Office of Air and Waste Management Contract EPA-IAG-D5-0463, Rept. EPA-450/3-74-067, 78p., Dec. 1974. 5 refs.*

NTIS: PB 244915/AS

A review of the Ohio implementation plan as required by the Energy Supply and Environmental Coordination Act of 1974 is presented as part of an effort to determine if revisions to control regulations for stationary fuel combustion sources can be made without interfering with the attainment and maintenance of the National Ambient Air Quality Standards for sulfur dioxide and total suspended particulates. There appears to be virtually no tolerance for increased particulate emissions throughout the state. There are indications that SO2 regulation revisions which would permit the use of higher sulfur local fuels are possible in some areas without violating the NAAQS. Coal blending to achieve moderate fuel sulfur content (1-2%) may be required to realize the clean fuels savings resulting from regulation revision. Area source emissions play a significant role in the air quality situation in portions of Ohio, and additional study is needed to determine a feasible level of control for these sources.

62675 **APTIC NO. 76081**

Argonne National Lab., Argonne, Ill., Energy and Environmental Systems Div. and Environmental Protection Agency, Atlanta, Ga., Regional Office IV

IMPLEMENTATION PLAN REVIEW FOR KENTUCKY AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Office of Air and Waste Management Contract EPA-IAG-D5-0463, Rept. EPA-450/3-74-077, 27p., Dec. 1974.*

NTIS: PB 246562/AS

A review of the Kentucky State Implementation Plan as required by the Energy Supply and Environmental Coordination Act of 1974 is presented as part of an effort to determine if revisions to control regulations for sulfur dioxide and total suspended particulate emissions from stationary fuel combustion sources can be made without interfering with the attainment and maintenance of the National Ambient Air Quality Standards. High particulate levels are being measured throughout most of the state, and there is little possibility for particulate regulation relaxation. Sulfur dioxide regulations show potential for relaxation in certain counties of the Paducah-Cairo and Bluegrass AQCR s, though in other regions the SO2 regulations need to be tightened.

62676 **APTIC NO. 76102**

Environmental Protection Agency, Atlanta, Ga., Regional Office IV and Argonne National Lab., Argonne, Ill., Energy and Environmental Systems Div.

IMPLEMENTATION PLAN REVIEW FOR FLORIDA AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT. *Office of Air and Waste Management Contract EPA-IAG-D5-0463, Rept. EPA-450/3-74-078, 21p., Dec. 1974.*

NTIS: PB 246867/AS

A review of the Florida State Implementation Plan as required by the Energy Supply and Environmental Coordination Act of 1974 is presented as part of an effort to determine if revisions to control regulations for sulfur dioxide and total suspended particulate emissions from stationary fuel combustion sources can be made without interfering with the attainment and maintenance of the National Ambient Air Quality Standards. There is little room for relaxation of particulate emission regulations, with only the Central Florida and Southwest Florida Air Quality Control Regions demonstrating a potential margin for absorbing increased emissions. The relaxation of SO2 emission limits to permit the burning of higher sulfur oil is possible in all regions except Jacksonville-Brunswick and West Central Florida. Significant savings of low sulfur oil can be achieved through this revision.

62677 **APTIC NO. 76164**

Environmental Protection Agency, Kansas City, Mo., Regional Office VII and TRW, Inc., Redondo Beach, Calif.

IMPLEMENTATION PLAN REVIEW FOR NEBRASKA AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Contract 68-02-1385, Rept. EPA-450/3-74-068, 67p., Dec. 1974. 13 refs.*

NTIS: PB 247813/AS

A review of the Nebraska State Implementation Plan, as required by the Energy Supply and Environmental Coordination Act of 1974, is presented to determine if revisions to control regulations for total suspended particulate and sulfur dioxide emissions from stationary fuel combustion sources can be made in an effort to effect clean fuel savings. Current particulate emission regulations do not appear to be overly restrictive, while existing SO2 emission regulations may be more restrictive than required to meet National Ambient Air Quality Standards. Considerable SO2 emission increases are capable of occurring, however, as a result of fuel switching within the limits of the present regulations; and, in this context, the present regulations do not appear overly restrictive. (Author summary modified)

62678 **APTIC NO. 76165**

Environmental Protection Agency, New York. Regional Office II and TRW, Inc., Vienna, Va.

IMPLEMENTATION PLAN REVIEW FOR NEW JERSEY AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Contract 68-02-1385, Rept. EPA-450/3-74-071, 77p., Dec. 1974. 11 refs.*

NTIS: PB 247805/AS

A review of the New Jersey State Implementation Plan, as required by the Energy Supply and Environmental Coordination Act of 1974, is presented to determine if revisions to control regulations for total suspended particulate and sulfur dioxide emissions from stationary fuel combustion sources can be made in an effort to effect clean fuel savings. Particulate emission limiting regulations do not appear to be overly restrictive in any New Jersey Air Quality Control Region, and only the New Jersey Intrastate AQCR appears to offer potential for clean fuel savings by means of a relaxation of the fuel sulfur content regulation. (Author summary modified)

62679 **APTIC NO. 76166**

Environmental Protection Agency, Boston, Mass., Regional Office I and TRW, Inc., Vienna, Va.

IMPLEMENTATION PLAN REVIEW FOR MAINE AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Contract 68-02-1385, Rept. EPA-450/3-74-074, 40p., Dec. 1974.*

NTIS: PB 247973/AS

A review of the Maine State Implementation Plan, as required by the Energy Supply and Environmental Coordination Act of 1974, is presented to determine if revisions to control regulations for total suspended particulate and sulfur dioxide emissions from stationary fuel combustion sources can be made in an effort to effect clean fuel savings. The Androscoggin Valley and Down East Air Quality Control Regions show some potential for revision of SO2 source emission regulations, and the Metropolitan Portland AQCR shows potential for regulation revision relating to suspended particulates. It is possible that additional clean fuel savings might be realized in the Aroostook and Northwest Maine AQCR s if more were known about their air quality status. (Author summary modified)

62680 **APTIC NO. 76167**

Environmental Protection Agency, Dallas, Tex., Regional Office VI and TRW, Inc., Redondo Beach, Calif.

IMPLEMENTATION PLAN REVIEW FOR NEW MEXICO AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Contract 68-02-1385, Rept. EPA-450/3-74-075, 53p., Dec. 1974. 11 refs.*

NTIS: PB 247814/AS

A review of the New Mexico State Implementation Plan, as required by the Energy Supply and Environmental Coordination Act of 1974, is presented to determine if revisions to control regulations for total suspended particulate and sulfur dioxide emissions from stationary fuel combustion sources can be made in an effort to effect clean fuel savings. Regulations covering particulate and SO2 emissions in the state do not appear to be overly restrictive based on a tolerance assessment for increased emissions and a review of the state s fuel combustion sources. Coal burning plants in the New Mexico portion of the Four Corners Air Quality Control Region account for more than half of the state s total hourly heat input at stationary fuel combustion facilities. (Author summary modified)

62681 **APTIC NO. 76168**

Environmental Protection Agency, Denver, Colo., Regional Office VIII and TRW, Inc., Redondo Beach, Calif.

IMPLEMENTATION PLAN REVIEW FOR COLORADO AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Contract 68-02-1385, Rept. EPA-450/3-74-080, 51p., Dec. 1974. 10 refs.*

NTIS: PB 247974/AS

A review of the Colorado State Implementation Plan, as required by the Energy Supply and Environmental Coordination Act of 1974, is presented to determine if revisions to control regulations for total suspended particulate and sulfur dioxide emissions from stationary fuel combustion sources can be made in an effort to effect clean fuel savings. Although Colorado uses the example region approach in developing control strategies for both total suspended particulates and SO2 and has corresponding air quality standards which are more stringent than the National Ambient Air Quality Standards, there are no indications that current regulations are overly restrictive. All of the Air Quality Control Regions in the state are reporting violations of the NAAQS for particulates. Sulfur dioxide emission regulations for existing sources were recently withdrawn from the State Implementation Plan. (Author summary modified)

62682 **APTIC NO. 76169**

Environmental Protection Agency, Denver, Colo., Regional Office VIII and TRW, Inc., Redondo Beach, Calif.

IMPLEMENTATION PLAN REVIEW FOR UTAH AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Contract 68-02-1385, Rept. EPA-450/3-74-081, 53p., Dec. 1874. 2 refs.*

NTIS: PB 248197/AS

A review of the Utah State Implementation Plan, as required by the Energy Supply and Environmental Coordination Act of 1974, is presented to determine if revisions to control regulations for total suspended particulate and sulfur dioxide emissions from stationary fuel combustion sources can be made in an effort to effect clean fuel savings. Emission regulations for existing sources do not appear to be overly restrictive despite the fact that the state uses the example region approach for developing control strategies for total suspended particulates and SO2. Utah has a wide spread particulate problem as indicated by reported violations of the National Ambient Air Quality Standards at every monitoring location. The only significant SO2 problem in the state is caused by process source emissions; and, once this source completes compliance efforts, SO2 air quality is expected to meet the NAAQS everywhere in the state. (Author summary modified)

62683 **APTIC NO. 76170**

Environmental Protection Agency, Dallas, Tex., Regional Office VI and TRW, Inc., Redondo Beach, Calif.

IMPLEMENTATION PLAN REVIEW FOR OKLAHOMA AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Contract 68-02-1385, Rept. EPA-450/3-74-083, 65p., Dec. 1974. 12 refs.*

NTIS: PB 248394/AS

A review of the Oklahoma State Implementation Plan, as required by the Energy Supply and Environmental Coordination Act of 1974, is presented to determine if revisions to control regulations for total suspended particulate and sulfur dioxide emissions from stationary fuel combustion sources can be made in an effort to effect clean fuel savings. Regulations covering particulate emissions do not appear to be overly restrictive. Violations in National Ambient Air Quality Standards for total suspended particulates were reported in every Oklahoma Air Quality Control Region. It is not known whether the low ambient SO2 levels in the state are due to overly restrictive emission regulations, to a low level of overall baseline emissions, or to some other factor. (Author summary modified)

62684 **APTIC NO. 76171**

Environmental Protection Agency, Boston, Mass., Regional Office I and TRW, Inc., Vienna, Va.

IMPLEMENTATION PLAN REVIEW FOR MASSACHUSETTS AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Contract 68-02-1385, Rept. EPA-450/3-74-084, 66p., Dec. 1974.*

NTIS: PB 248392/AS

A review of the Massachusetts State Implementation Plan, as required by the Energy Supply and Environmental Coordination Act of 1974, is presented to determine if revisions to control regulations for total suspended particulate and sulfur dioxide emissions from stationary fuel combustion sources can be made in an effort to effect clean fuel savings. There are two Air Quality Control Regions, Berkshire and Central Massachusetts, which indicate some potential for additional revision of fuel combustion source emission limiting regulations for SO2. However, these AQCR s have limited potential due to relatively low volumes of total fuel used. There are no AQCR s which possess potential for toaal suspended particulate regulation revision. (Author summary modified)

62685 **APTIC NO. 76276**

Hokkaido Prefectural Government, Hokkaido (Japan), Dept. of Life Environment

SITUATION OF ENVIRONMENTAL POLLUTION DISPUTES IN HOKKAIDO. *(Hokkaido ni okeru kogai kujo no genjo). Text in Japanese. 50p., Oct. 1974.*

Data on pollution related complaints filed in Hokkaido during 1973 were compiled and analyzed. The total number of pollution complaints filed was 1998, which was about 3.6 times that of 1969. Classification of complaints was as follows: pollution type (noise and vibration 32%, malodor 25%, air pollution 19%, water pollution 16%); region (Ishikari 33%, Kamikawa 17%, Tanshin 9%); population density (cities with population over 100,000 68%, other cities 15%, towns 16%); and type of pollutant source (production industries 28%, livestock industry 10%, building and highway construction 8%). Complaints about sensory and psychological nuisances were about 80% of the total, and health hazard and property damage were about 10%. Out of 1998 complaints filed, 1847 cases (92%) were processed.

62686 **APTIC NO. 79755**

Daito Ward Office, Tokyo (Japan)

ENVIRONMENTAL POLLUTION AND ENVIRONMENT IN DAITO WARD: 1973. *(Daito-ku no kogai to kankyo: Showa 48-nen). Text in Japanese. 121p., March 1974.*

Types of pollution, pollution control administration, pollution countermeasures, and environmental improvement, in Daito Ward are reviewed. Daito Ward, with a 1974 population of 217,000, covers 10 sq km in the northeastern section of Tokyo, and consists of a mix of residences, small industries (leather goods, printing, light machinery), wholesalers, commercial and amusement enterprises. A Department of Pollution was established in 1959, with constantly expanding duties and personnel. There has been a downward trend in pollutant concentrations, but concentrations of carbon monoxide, nitrogen oxides, and sulfur dioxide still exceed environmental standards part of the time. When photochemical oxidant alerts have been issued for Tokyo, Daito Ward has been affected at least 50% of the time. Attempts are being made to improve water quality of rivers, creeks, and ponds in the ward. Waste water from some 93 plating factories (86% of them employing less than 10 persons) is being monitored. Noise level standards have been established by the government, but enforcement is complicated by the subjective nature of unpleasantness caused by sound. In 1972, there were 16,650 pollution complaints for all Tokyo, of which 312 originated in Daito Ward. Complaints about construction activity and factories comprised about 50% of the total for both city and ward. More than 65% of the complaints in the ward dealt with noise and malodor. As of October 31, 1973, there were 105 reported cases of bronchial asthma and 156 cases of asthmatic bronchitis in the ward, totaling 1.9% of the total reported number of respiratory cases for Tokyo. Planting of greenery is encouraged to improve the environment.

62687 **APTIC NO. 80234**

Sobotka and Co., Stamford, Conn.

POLICY GUIDELINES FOR AUTOMOBILE EMISSIONS CONTROL: A REVIEW OF THE STUDY ON AIR QUALITY AND AUTOMOBILE EMISSION CONTROL BY THE NATIONAL ACADEMY OF SCIENCES (FINAL REPORT). *Dept. of Transportation Contract PS-50219, Rept. DOT-S-75-1, 10p., Nov. 18, 1974.*

NTIS: PB-238 510

Control policies are suggested which appear most reasonable on the basis of the evidence on air quality and automobile emission control presented by the National Academy of Sciences. The benefits and costs of controlling automobile pollution are large. The potential benefits justifying development of a rigorous control program. The large potential costs imply the program should be carefully structured to assure cost minimization, so as to conserve resources and to make such a program more acceptable. The level and timing of current nitrogen oxides standards are questionable. Both should probably be relaxed. The cost savings from doing so are substantial. A single national standard for automobile emissions is unjustified. A preferable policy would allow two or more standards depending on the severity of the problem. Local implementation modeled on the State Implementation Plans for stationary sources seems preferable to national auto emission regulations. Federal ambient air quality standards can be achieved in the least costly manner by taking advantage of the potential tradeoffs between automobile emissions, auto use limitations, and control of emissions from stationary sources. These tradeoffs can only be made if local conditions are considered. (Author abstract modified)

1973

62688 **APTIC NO. 79814**

Angeletti, Evelyn M.

TRANSMOGRIFICATION: STATE AND FEDERAL REGULATION OF AUTOMOTIVE AIR POLLUTION. *Natur. Resources J., 13(3):448-479, July 1973. 192 refs.*

The scope of automotive air pollution problems is outlined. The history and status of legislation, enforcement programs, and prospects for future governmental control of motor vehicle emissions are explored. State emission standards are discussed. The role of the states with respect to the federal government in implementing the 1970 Clean Air Amendments is explored. Suggestions are made concerning the course federal and state action should take in developing a cooperative national program for setting and enforcing emission standards for vehicles in use. The problem of motor vehicle pollution control requires a unified, cooperative effort on the part of federal and state governments. (Author abstract modified)

62689 **APTIC NO. 76465**

Cevidalli, G.

WHAT IS THE POSITION WITH THE CONTROL OF INDUSTRIAL POLLUTION IN ITALY? *(A che punto siamo con il controllo degli inquinamenti industriali in Italia)? Text in Italian. Ceramurgia, 3(2):111-113, 1973.*

Despite a certain improvement in the control of industrial pollution in Italy, progress is slow for a number of reasons. Regulations and legal standards are imprecise and dated. While technical and scientific knowledge is adequate to cope with the problems, it is not being used. The establishment of definite and precise norms for the limitation and control of pollutants is thus difficult. The planning of economical treatment facilities is impeded by a lack of information on the quality of effluents being discharged from industrial installations. Thermal pollution is a prime example. There is need for guidelines for concerted and organized ecological planning.

62690 **APTIC NO. 76228**

Davila, Guillermo H.

JOINT AIR POLLUTION MONITORING PROGRAM DEVELOPED IN THE CITIES OF JUAREZ, CHIHUAHUA, MEXICO; EL PASO, TEXAS; AND LAS CRUCES, NEW MEXICO. *Pan American Health Organization, El Paso, Tex., United States-Mexico Border Field Office, Binat. Symp. Air Pollut., 1st, El Paso, Tex., 1973. p. 155-169. (Sept. 27-28.)*

A joint air pollution monitoring program developed for the Mexican-American border cities of Juarez, Chihuahua, Mexico; El Paso, Texas; and Las Cruces, New Mexico is described. Coordination of all program activities is carried out through a Subcommittee on Air Pollution established under the Environmental Health Committee of the cities of El Paso, Juarez, and Las Cruces which in turn is related to the Binational Health Council of El Paso and Ciudad Juarez. Presently three studies are being conducted to determine ambient particulate pollution. A total of 10 high volume filters are used to make weekly determinations in commercial, residential, and rural areas of the three cities. A fourth study is being conducted to determine sulfur dioxide concentrations.

62691 **APTIC NO. 76460**

Gustafson, S. A. and K. O. Kortanek

MATHEMATICAL MODELS FOR AIR POLLUTION CONTROL: DETERMINATION OF OPTIMUM ABATEMENT POLICIES. *In: Models for Environmental Pollution Control. Ann Arbor, Mich., Ann Arbor Science Publishing Inc., 1973, Chapt. 13, p. 251-265. 12 refs.*

A mathematical model for the determination of optimum air pollution abatement policies at minimum costs is described. The model constructs a policy that guarantees that the annual arithmetic mean of the pollutant concentration is not above a given standard at any point of a control area. The model is applied to the case of a multiple-source urban air control area, though it can also be applied to pollution episodes in cities or to large-scale areas. Topics discussed in relation to the model include: the concept of source inventory, the construction of transfer functions, the selection of control variables and cost functions, sensitivity analyses and the influence of errors, and the computational determination of an optical solution.

62692 **APTIC NO. 82631**

Holmes, John, Joel Horowitz, Robert Reid, and Paul Stolpman

THE CLEAN AIR ACT AND TRANSPORTATION CONTROLS. AN EPA WHITE PAPER. *Environmental Protection Agency, Washington, D. C., Office of Air and Water Programs, Rept. EPA-400/9-74-001, 40p., Aug. 1973.*

The impact and feasibility of key components of transportation control plans being proposed are examined in relationship to the attainment of air quality standards. Transportation and vehicle emission controls considered include: inspection/maintenance programs, retrofit programs, and the reduction of automobile use. Cost-effectiveness estimates are given for individual control measures, and the effects of combinations of control measures on air quality are also assessed. Compliance with air quality standards by 1977 in some regions is expected to require not only inspection/maintenance and vehicle retrofit measures but also substantial vehicle use reductions which may amount to more than 20% in some cases. A list of Air Quality Control Regions exceeding the air quality standards for carbon monoxide, nitrogen dioxide, and oxidants is provided.

62693 **APTIC NO. 76340**

Kato, Tsuneo

AGAINST POWER PLANT POLLUTION: CITIZEN MOVEMENT IN AMAGASAKI. *(Denryoku kogai ni hantai shite: Amagasaki ni okeru jumin undo). Text in Japanese. Denryoku Sangyo To Kogai (Power Ind. Pollut.), no. 6:39-41, Sept. 1973.*

Pollution problems from Amagasaki Power Plant No. 1 and Power Plant No. 2, built in the 1930 s for coal-burning, and converted since to burn oil, are discussed. Amagasaki No. 3 is a modern showplace power plant, but No. 1 and No. 2 are antiquated, and have hardly any effective pollution control measures. The stacks are 60-66 m high. The only pollution countermeasures consist of burning low-sulfur oil. In 1971, only about 2% of the total yearly power output was from No. 1 and No. 2. Full operations began again at No. 1 and No. 2 in June 1972, because of power supply problems due to an explosion at a power plant in Wakayama Prefecture. At a series of 4 meetings held between concerned citizens and the company, moderated by the Municipal Environmental Office, it was agreed that No. 1 was to be shut down in November 1973. Until then, 0.1% sulfur content fuel was to be burned at No. 1 and No. 2 and 0.3% sulfur content fuel [illegible] No. 3 and another plant nearby. The Kansai Power Co. agreed to pay costs borne by patients certified as pollution victims, including death benefits, medical, hospital, and convalescent costs. Hyogo Prefecture ordered Kansai and other enterprises to contribute to a pollution relief fund of $2.5 million for this purpose.

62694 **APTIC NO. 80232**

Koutsandreas, John D.

EPA REQUIREMENTS AND PROGRAMS. *National Aeronautics and Space Administration, Washington, D. C., Earth Resour. Technol. Satell. -- 1, 3rd Symp. Proc. Washington, D. C., 1973, p. 115- 120. (May 30-31.)*

NTIS: N-75-16050

The objectives of Environmental Protection Agency (EPA) monitoring include characterizing conditions, identifying trends, evaluating compliance with standards, and assessing interchange of pollutants among air, water, and land. Short term research aims at providing measurement capabilities required by regulatory deadlines. The EPA research and monitoring should have use in problem solving. The monitoring is performed by networks throughout the nation and by special projects where information is not provided by the networks. Successful pollution control rests largely upon reliable and timely data. The acquisition of legally defensible data requires standardized measurement and calibration procedures, interlaboratory quality control, laboratory performance certification, and standardized record keeping. The prime objective of the proposed Earth Resources Technology Satellite (ERTS)-Data Collection System is to give the EPA the capability to evaluate, through demonstrable hardware, the effectiveness of automated data collection techniques. Regional control agencies should provide information during episodes and daily for statistical evaluation. No provisions presently exist for remote sensing or unattended facilities satisfying their total requirements. The fundamental concept of the proposed automated monitoring system is to design the equipment around an inexpensive programmable computer or desk calculator. This provides flexibility allowing for a variety of peripheral devices. Data relay systems available in ERTS and similar satellites could provide near real time data using the Data Collection Platform. Systems able to monitor specific environmental parameters for months without servicing could provide data for establishing baselines and identifying environmental trends.

62695 **APTIC NO. 76256**

Krier, James E., Lester Lees, and Daniel Dawes

STATE POWER PLANT SITING: A SKETCH OF THE MAIN FEATURES OF A POSSIBLE APPROACH. *California Inst. of Technology, Pasadena, Environmental Quality Lab., Memorandum 4, 42p., Feb. 1973.*

A sketch is provided of the major outlines of one possible approach to power plant siting for the state. Elements of the approach include a siting council, open planning, an environmental advocate, research and development, and funding. Judicial review should be as full and open as possible, with a broad scope of review and access to all interested parties, but it should be sought immediately after certification, and once completed it should be final. A state siting statute should include sections on findings of fact and statement of policy, definitions, prohibitions, the thermal power plant siting council, its powers and duties, the office of environmental advocate, site selection and certification, judicial review, preemption, revocation or suspension of certification, restraining orders, funding, public access to documents, and liberal construction and severability. Recommended contents of the sections are outlined.

62696 **APTIC NO. 84106**

Lehmann, A.

CALCULATION OF PERMISSIBLE DUST EMISSIONS. *(Zur Berechnung zulaessiger Staubemissionen). Text in German. Idojaras (Budapest) 77(5):270-278, Sept.-Oct. 1973. 3 refs.*

A method is presented for determining the magnitude of the permissible dust emission close to an emission source. A mathematical model of the relationships between emission and pollutant concentration involved dust concentrations around the emission source area at indicated chimney heights and emission quantities, the emission concentration at a certain chimney height if a hygienically permissible level of dust pollution near the surface was not to be exceeded, and the elevation of the stack that insures that dust pollution remains within preset limits. The model suggested was based on the Bosanquet, Carey, and Halton Formula for calculating dust sedimentation as a function of meteorological conditions and type and quantity of dust emission. An important factor in the equation was the size of floating dust particles. The method proposed was suitable because of its simple routine evaluation of multiple sources despite limited accuracy of results due to the rough division into only 2 dust grain sizes. The determination of the sedimentation speed of both dust types was technically significant. A sedimentation speed of 0.13 m/sec determined for fine-grained dust was the speed at which a dust quantity emitted produced a dust pollution level of 20 g/sq m/month while the same quantity of floating dust caused a pollution concentration of 0.5 mg/cu m.

62697 **APTIC NO. 75955**

Morgenstern, Paul

SUMMARY REPORT ON MODELING ANALYSIS OF POWER PLANTS FOR COMPLIANCE EXTENSIONS IN 51 AIR QUALITY CONTROL REGIONS (FINAL REPORT). *Abcor, Inc., Cambridge, Mass., Walden Research Div., Office of Air and Waste Management Contract 68-02-0049, Tasks 8 and 11, Program Element 2AC129, Rept. EPA-450/3-75-060, 83p., Dec. 1973. 48 refs.*

NTIS: PB 244932/AS

A summary of diffusion modeling analyses of sulfur dioxide emissions from power plants in 51 Air Quality Control Regions is presented as part of an effort to determine to what extent, if any, variances to state implementation plans can be granted in the face of a low-sulfur coal deficit. The total aggregate annual coal consumption by some 206 power plants included in the study is 290 million tons. The allowable sulfur content that can be affected by the application of variances is approximately 145 million tons. Major changes projected are a net decrease of 137 million tons of low-sulfur coal (less than 1.0% sulfur) and a net increase of 109 million tons of coal with a sulfur content greater than 2.0%. The study is intended only to demonstrate the general feasibility of reducing the low-sulfur coal deficit by compliance extensions and is not based on sufficient analysis to allow the formulation of decisions regarding individual power plants. (Author abstract modified)

62698 **APTIC NO. 76343**

Nakajima, Isamu

THERMAL POWER PLANT PROTEST MOVEMENT IN FUJI CITY. *(Fuji-shi ni okeru karyoku hantai undo). Text in Japanese. Denryoku Sangyo To Kogai (Power Ind. Pollut.), no. 6:30-33, Sept. 1973.*

Struggles over thermal power plant construction at the mouth of the Fuji River, Shizuoka Prefecture, are described. In 1968, Tokyo Denryoku (Toden) applied for a permit to construct the power plant. Fuji City, in turn, asked for adherence to antipollution requirements. As protest to construction mounted, Toden announced that 1.0% low sulfur fuel would be burned at the plant, and the height of the collective stack would be increased to 200 m. The plant would be located on 700,000 sq m of land, and initially, would produce 1.05 million kW of power. Toden mounted a man-to-man public relations campaign, emphasizing its desire to minimize pollution, and provide ample power for future needs. A petition was circulated on behalf of power plant construction in Fuji City, and in the eastern section of Shizuoka Prefecture. Workers and fishermen formed the backbone of protest movements. Violence erupted. Citizen awareness of pollution problems was cultivated. Study groups were organized to examine pollution scientifically. Despite protests, a stand of pine trees which act as a breakwater and windbreak was partially destroyed as a result of building a concrete breakwater. Construction of the power plant is now in abeyance, but citizen interest has also diminished.

62699 **APTIC NO. 80610**

Preda, Milea

GREEN SPACES -- A MEANS OF AVOIDING POLLUTION OF THE ATMOSPHERE. *(Spatiile verzi -- mijloc de inlaturare a poluarii atmosferei). Text in Roumanian. Rev. Horti. Viti., 22(9):77-82, Sept. 1973.*

Material for this review article seems to be drawn entirely from West European and U. S. sources. Summarized are the history of the green space concept, growing threat of air pollu-

tion to human society and to plant life, experimental data from green space research, and guiding principles for planning and utilizing green space. Poplars, alders, willows, oaks, plane trees and beeches are the trees most resistant to pollution. The Austrain black pine is the most resistant of the evergreens. It is important to have proper spacing of trees, lawns, etc. with respect to industrial plants, main highways and other major pollution sources.

62700 **APTIC NO. 81817**

Settle, John E., Jr.

GUARDING THE GUARDIAN: THE CITIZEN SUIT FOR CLEAN AIR. *Environ. Law, 3(1):1-21, Spring 1973. 119 refs.*

A brief history of Federal air pollution legislation and the political dynamics of the 1970 Clean Air Act is presented along with an evaluation of the citizen suit provision of the Clean Air Amendments of 1970. The citizen suit provision establishes the private citizen as a custodian of the environment with recourse to both the agencies and the courts to attain compliance with air pollution standards. The amount of litigation that is eventually pursued under the citizen suit section depends largely on the collective attitudes of private attorneys general, enforcement agencies, industry, and the judiciary. Responsive court action can do much to give the citizen suit the in terrorem effect on polluters and agencies that was intended by the drafters. The favorable judicial response to recent environmental litigation based on the National Environmental Policy Act enhances the potential of the citizen suit and leads to speculation that similar provisions will be enacted in future environmental legislation.

62701 **APTIC NO. 79813**

Shaw, Charles Anthony

FEDERAL JURISDICTION -- ENVIRONMENTAL LAW -- DAMAGE CLAIMS IN POLLUTION ACTIONS BROUGHT UNDER SECTION 304 OF THE FEDERAL CLEAN AIR ACT. *Natur. Resources J., 13(3):511-534, July 1973. 165 refs.*

A plaintiff seeking damages under Section 304 of the Clean Air Act should be permitted to avail himself of federal jurisdiction. Three methods are discussed by which this might be accomplished. The first method involves a process of judicial construction of Section 304(a) allowing for a federal claim for damages. The second is based upon the doctrine of pendent jurisdiction over state claims. The third, the most tenuous, is based upon the doctrine of protective jurisdiction. (Author abstract)

62702 **APTIC NO. 76342**

Toishi, Shiro

PRESENT SITUATION OF THERMAL POWER PLANT PROTEST MOVEMENT IN CHOSHI. *(Choshi ni okeru karyoku hantai undo no gendankai). Text in Japanese. Denryoku Sangyo To Kogai (Power Ind. Pollut.), no. 6:34-38, Sept. 1973.*

Since 1969, periodic attempts have been made by the Toden Electric Co. to build a 5.2 million kW power plant on 300,000 sq m of landfill, at the behest of prefectural and regional authorities and moneyed interests. A 12-point development plan, including leisure and recreational facilities as well as harbor improvements is under consideration. Citizen groups feel that needless destruction of greenery, agricultural land, fishing grounds, and coastline would result. Positive pollution from sulfur dioxide and nitrogen oxides would also be problems. Matters are at a standoff now. Citizen awareness of scientific methods is necessary to cope with increasing pressures for development.

62703 **APTIC NO. 81927**

Yeager, Kurt E.

THE EFFECT OF DESULFURIZATION METHODS ON AMBIENT AIR QUALITY. *Advan. Chem. Ser., no. 127:48-68, 1973. 14 refs. (Presented at the American Chemical Society, Division of Fuel Chemistry and Division of Petroleum Chemistry, Meeting, 164th, New York, Aug. 29-30, 1972.)*

The use of selective source control strategies based on established diffusion modeling techniques for reducing ambient sulfur dioxide levels without resulting in a cumulative low-sulfur coal and oil supply deficit is discussed. The simple use of emission reduction, irrespective of emission source, as a means of achieving National Ambient Air Quality Standards for sulfur dioxide is projected to result in cumulative low sulfur [illegible] and oil supply deficit in 1975 amounting to 8 times 10 to the 15 Btu. Data on sulfur dioxide emissions and air quality concentrations in the Metropolitan Chicago Air Quality Control Region indicate that an average reduction of 50% in ambient sulfur dioxide concentrations throughout the city of Chicago can be obtained by only a 15% reduction in ambient sulfur dioxide emissions within the total AQCR. On a source category basis within the total AQCR, area source sulfur dioxide emissions were reduced 34%, industrial combustion emissions were reduced 4%, and electric utility combustion emissions were reduced 13%.

62704 **APTIC NO. 81862**

PEDCo Environmental Specialists, Cincinnati, Ohio

TECHNICAL GUIDE FOR REVIEW AND EVALUATION OF COMPLIANCE SCHEDULES FOR AIR POLLUTION SOURCES (FINAL REPORT). *Environmental Protection Agency Contract 68-02-0607, Task, 5, Rept. EPA-340/1-73-001-a, 41U-762-5, 276p., Aug. 1973. 54 refs.*

NTIS: PB 250374/AS

Model compliance schedules are presented for 34 industries in the following source categories: stationary combustion, solid waste disposal, evaporation sources (surface coating, petroleum storage), chemical processes, agricultural products, metals industries, mineral industries, the petroleum industry, and the pulp and paper industry. Estimates of time periods which are as expenditious as practicable are given for applying reasonably available control technology which includes process modifications and add-on control devices. Process descriptions are also provided for individual sources.

62705 **APTIC NO. 82788**

Comptroller General of the United States, Washington, D. C.

ASSESSMENT OF FEDERAL AND STATE ENFORCEMENT EFFORTS TO CONTROL AIR POLLUTION FROM STATIONARY SOURCES. *Rept. B-166506, 47p., 1973.*

Federal and state enforcement efforts to control air pollution from stationary sources are assessed. Prior to the enactment of the Clean Air Amendments of 1970, both Federal and state governments generally relied on polluters voluntary compliance with air pollution control laws and regulations. Factors contributing to limited state enforcement of air pollution laws included the lack of complete emission inventories, inadequate regulations, insufficient resources, and inadequate surveillance. Federal enforcement proved time-consuming and cumbersome, and no enforcement actions were taken under the procedures of the Air Quality Act of 1967. Both Federal and state air pollution control programs have improved since enactment of the Clean Air Amendments of 1970. Air quality regions are established for the nation, and states are submitting implementation plans as well as taking action to correct factors contributing to limited enforcement.

62706 **APTIC NO. 84467**

Union des Chambres Syndicales de l Industrie du Petrole, Paris (France), Comite Professionel du Petrole

AIR POLLUTION. *(Pollution atmospherique). Text in French. In: Reglementation concernant le stockage et l emploi des fuel-oils utilises pour le chauffage, p. 131-147, Dec. 1973.*

General legal regulations concerning air pollution in France and in the Paris urban agglomeration are presented. Rigorous sanctions, including imprisonment and imposition of fines, as well as temporary shutdown of polluting installations are provided for in cases of violation of the legal regulations. Special protection zones have been delimited as a function of population density, the quality and quantity of suspended matter, the concentration of sulfur dioxide and other toxic gases, the light absorption of the atmosphere, and local climatic influences. The use of certain fuel oils with high sulfur content has been prohibited in the special protection zones in Paris, and heating equipment is subject to regular inspections by the authorities.

1972

62707 **APTIC NO. 84365**

Armstrong, David D.

RINGELMANN NUMBERS AND THE LAW. *In: Air Quality Instrumentation. Selected Papers from International Symposia, presented by the Instrument Society of America, John W. Scales (ed.), Vol. 2, Pittsburgh, Pa., Instrument Society of America, 1974, p. 117-130. 57 refs. (Presented at the Instrument Society of America Conference and Exhibit, Annual, 27th, Oct. 9-12, 1972.)*

The use of the Ringelmann Chart as a smoke emissions standard for air pollution control regulations is discussed against the background of court decisions regarding its validity. Although the courts consider the Ringelmann Chart as not being unreasonably arbitrary, an argument is made in favor of phasing out this standard and replacing it with source emission standards. The Ringelmann Chart is viewed as being a nebulous and subjective standard which does not account for the composition of particulates nor the presence of invisible gaseous components in source emissions.

62708 **APTIC NO. 49390**

Asakino, Kunihiko, Sekio Izumikawa, Nobuo Ito, Masataka Hayafuku, Rinko Nagata, Tomio Hirono, Kinji Nakano, Hiroshi Yamazaki, and Toshio Ohira

REGIONAL PERMANENT MONITORING STATIONS FOR SULFUR DIOXIDE. *(Aryusangasu ni kansuru jojisokuteiten no chiikidaihyosei ni tsuite). Text in Japanese. Tokyo-to-Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), vol. 3: 11-16, March 1972. 3 refs.*

Four of the 22 monitoring stations in Tokyo were studied to determine if they were really representative of the area. The values changing with time throughout the entire period were geometrically averaged and presented in graphic form. A 50% geometric average, a 16% geometric average minus a geometric standard deviation value, and a 84% geometric average plus a geometric standard deviation value were developed. This calculation presupposed that time distribution of sulfur dioxide approximates logarithmic regular distribution. Values were calculated for temporary measuring points in the respective regions and compared with those of the four permanent measuring points. Generally, the permanent measuring points accurately represented a wide area if no major emission sources were nearby.

62709 **APTIC NO. 42835**

Daley, J. C. and E. C. Johnson

EMISSION CONTROL PROCESS SELECTION. *J. Metals, 24(7):30-34, July 1972. 3 refs.*

The difficulty of making investment decisions in the face of uncertain air standards can be eased somewhat by approaching the problem in a logical, disciplined manner. The copper smelter manager can adapt the logic of a taxonomy to the emission control selection problem, carefully classifying each feasible strategy, and thus assuring consideration of all approaches while providing a simple, visual basis for discussion of alternatives. Decision trees, now gaining wide acceptance as an investment decision-making tool, can be used to good advantage in assessing the relative economics of a variety of smelter emission control problems. The expected value of the alternative strategies takes into account capital and operating costs, revenues, timing of cash flows, capital discount rate, and the probability of future events occurring. Problems are presented which illustrate these two techniques. (Author conclusions modified)

62710 **APTIC NO. 81777**

Dewees, Donald N.

ECONOMIC CONSIDERATIONS IN THE SELECTION OF POLLUTION CONTROL LEGISLATION. *Osgoode Hall Law J., 10(3):627-646, Dec. 1972. 51 refs.*

The economic and administrative advantages and disadvantages of two alternative legal devices for air pollution control are reviewed. Traditional pollution control legislation, utilizing direct regulation by emissions standards with fines and penalties for violations, may be preferred in cases where abatement costs are easily predicted or limited, where the magnitude of harm is uncertain or potentially quite lare, where costs are uniform among sources, and where improvements in abatement technology are either not needed or not expected. On the other hand, when costs are uncertain, benefits are small or limited, and there is an expectation of significant technological improvement or a long time is required for the installation of required control devices, then abatement can be achieved more rapidly and at a lower cost by the use of an effluent charge. A combination policy utilizing a small amount of permitted emissions and with a reasonable effluent charge proportional to any excess may provide the best control solution in cases which share some of the features of both categories outlined above. (Author conclusions modified)

62711 **APTIC NO. 67143**

Kassoff, Harold and David S. Gendell

AN APPROACH TO MULTIREGIONAL URBAN TRANSPORTATION POLICY PLANNING. *Highway Res. Rec., no. 348:76-93, 1973. 1 ref.*

An ongoing research and development project oriented toward providing an analytical framework for broad, policy-level, transporation investment decisions that simultaneously affect a large number of urban regions is described. The overall effort is known as the Transportation Resource Allocation Study. The urban area models that have been developed are capable of evaluating the economic and external consequences of alternative transportation investments. In addition to incorporating the traditional user-related items (such as time, operating, and accident costs), the model attempts to dimension the urban road construction impacts that are felt by the entire community. These include air pollution, displacement, and noise. The process, which is somewhat analagous to transportation planning at the local level, proceeds from a statement of land development and transportation investment alternatives and continues through travel generation on the basis of an equilibrium demand model, development of system performance measures, economic investment-return analysis, and evaluation that provides a framework for including non-costable constraints. The model system is capable of determining an optimum highway investment level, indicating the investment required to reach a specified performance level, and providing an indication of the consequences of alternative investment strategies. A separate set of models is under development for rural areas. (Author abstract)

62712 APTIC NO. 47255

Ohira, Toshio and Mitsuru Utagawa

MEASUREMENT OF AIR POLLUTION AND THE DATA HANDLING. (NO. 3). *(Taiki osen no sokutei to deta shori). Text in Japanese. Bunseki Kiki (Analysis Instr.), 10(11):754-761, Nov. 1972. 8 refs.*

Monitoring network and telemeter system data are utilized for surveying air pollution and meteorological conditions, for making judgments for emergency alerts and releases and pollution predictions, for quick enforcement of emergency communication and operation, for continuous monitoring of sulfur dioxide emissions from emission sources, and for simultaneous communication of emergency alert to the public, to emission sources, and to government agencies. The final stage of the Tokyo metropolitan government air pollution monitoring network will have 22 general air pollution monitoring stations, 33 motor vehicle exhaust gas monitoring stations, two vertical monitoring stations, and 15 street electric sign boards. The basic data handling will include the treatment of air pollutant data, such as hourly averages, dispersion, standard errors, geometrical averages, frequency and concentration of pollutants, meteorological data and relationships between each data. These monitoring networks will yield about 1000 data per hour and 864,000 data per year on sulfur dioxide, nitrogen dioxide, nitric oxide, carbon monoxide, automobile exhaust, dusts, oxidants, wind direction and velocity, temperature, humidity, ultraviolet rays, and traffic. As of April 1972, the network yielded about 605 data.

62713 APTIC NO. 41313

Ross, Steven S. and Laurence J. White

INTERNATIONAL POLLUTION CONTROL. *Chem. Eng. Deskbook, 79(10):137-152, May 8, 1972.*

Abatement laws, enforcement, and control technology with respect to pollution control on an international forum are reviewed for Austria, Belgium, Brazil, Canada, England, France, Germany, Italy, Japan, Mexico, the Netherlands, the Soviet Union, Eastern Europe (Czechoslovakia, Hungary, Bulgaria, Poland, and East Germany), Sweden, and Taiwan. Systems of financing pollution control technologies; air quality standard development; water pollution controls; the respective roles of federal and local governments; taxation and fining systems; control projects; and litigation are considered.

62714 APTIC NO. 41594

Semling, Harold V., Jr.

POLLUTION LEGISLATION: HOUSE VERSION COOLS THE PANIC OVER ZERO DISCHARGE BILL. *Chem 26, 8(6):FG18-FG22, June 1972.*

The House Public Works Committee approved a water pollution control bill that is considered in some respects weaker than one passed unanimously by the Senate. The House Bill has fewer controls and allows more money for research. The House bill also provides that the Administrator of the Environmental Protection Agency may extend the 1976 and 1981 abatement deadlines. The Senate water pollution control bill does not provide for any deadline readjustment. Representatives of the American Paper Institute told the House Committee that the key issue was the unqualified elimination of all pollutants by 1985. The zero discharge provision, if applied to the paper industry, would require the use of technological advances not yet in existence. Expected price increases in the paper industry range from 3.5 to 10%. Of 752 pulp and paper mills now in operation, 329 have been identified as marginal. It was estimated that rising costs would force 90 to 100 mills to close with the imposition of abatement regulations. However pollution abatement costs are not expected to have any effect on the competitiveness of U. S. paper products.

62715 APTIC NO. 42158

Syrota, M. J.

THE ACTIVITY OF THE ADMINISTRATION. *(L action de l administration). Text in French. Pollut. Atmos. (Paris), 14(54):196-199, April-June 1972.*

The role of the adminstration in pollution control as well as standards imposed on different emission sources, such as automobiles, combustion, and industry, and future plans are outlined. The activity of the Energy Utilization Advisory Board (Comite Consulative de l Utilisation de l Energie) is reviewed. The cement industry, now planning an investment of approximately $70 million for air pollution control projects, has been required to respect a maximum dust emission rate of 150 micrograms/N cu m under normal operating conditions since 1971. Though there are economic incentives for certain pollution control projects, the expenditures are incorporated in the prices in most cases. Specific aids to be granted to the different branches of industry on a contractual basis are envisaged by the government. After regulations for new industrial plants will have been elaborated, those for existing units will be worked out. While the Paris region is served by a highly developed pollution monitoring network, most sulfur dioxide and carbon monoxide measuring programs are run by different, non-coordinated organizations, which greatly reduces the comparability and accessibility of the test data. A high-quality measuring network will be set up within the next five years, and industries generating emissions above a certain level will be required to operate some of the stations of this network, or to contribute proportionally toward the operating costs of such stations.

62716 APTIC NO. 37500

FEDERAL CONTROL OF EMISSIONS ENDS WITH SALE OF NEW AUTOS. *Water Pollution Control (Toronto), vol. 110:47-48, Feb. 1972.*

The first priority of the Federal automobile program is to check new cars for compliance with current emission standards. The 1971 regualtions require a 100% reduction in crankcase emission, 75% in carbon monoxide, and 67% in hydrocarbon emissions. The Ministry of Transport chooses a representative sample of all the males and models of motor vehicles imported into or made in Canada. This sample is then tested for compliance with the emission standards by the Air Pollution Control Directorate. Test procedures for light- and heavy-duty vehicles are described. The main emission control systems for gasoline engines now in use are listed.

62717 APTIC NO. 50[illegible]82

TRW Systems Group McLean, Va., Transportation and Environmental Operations

TRANSPORTATION CONTROL STRATEGY DEVELOPMENT FOR THE NEW YORK METROPOLITAN AREA (FINAL REPORT). *Office of Air Quality Planning and Standards Contract 68-02-0048, Proj. DU-72-B895, Pub-APTD- 1371, 212p., Dec. 1972. 14 refs.*

NTIS: PB 218332

Transportation control strategies to achieve carbon monoxide photochemical oxidant, and nitrogen oxide air quality standards for the New York metropolitan area by 1977 were studied. Air quality for the area was analyzed, and the most promising transportation controls and their air quality impact were determined. The 1977 air quality predictions were based on extant air quality data and emission factors, traffic data, projected growth patterns, and legal and political considerations. The highest levels of CO were observed in the downtown and midtown sections of Manhattan where maximum 8-hour concentrations of 45 and 32 ppm, respectively were determined. The general area had a maximum 1-hour oxidant level of about 0.18 ppm, and congested areas had a maximum 1-hour NOx level of 0.08 ppm. Control measures wer assessed with respect to resulting emission reductions and cost and time considerations. The proposed control package included vehicle turnover, a retrofit program for heavy- duty vehicles, and inspection-maintenance of taxis are personal vehicles. Implementation and monitoring programs are reviewed.

62718 **APTIC NO. 82861**

Tokyo Metropolitan Government (Japan)

OUTLINE OF PLAN TO PROTECT CITIZENS OF TOKYO FROM ENVIRONMENTAL POLLUTION, 1972. *122p., 1972.*

Both air pollution and other forms of pollution are discussed. The present air pollution situation is described, including the increase in air pollution resulting from the switchover from coal to heavy fuel oil for factory and heating use, the large number of small pollution sources, Tokyo s susceptibility to pollution from two nearly industrial areas, and the increase in the number of automobiles. Countermeasures against sulfur oxides include tightening current control of sulfur oxides in fuels and discharge, control of location of factories, use of fuels other than heavy fuel oil to heat new buildings, and regional cooperation on pollution problems. Countermeasures against soot and dust include installation of dust collectors and conversion to fuel oils with low ash content or from fuel oils to other fuels. Countermeasures against soot and dust produced by motor vehicles are still being developed. Countermeasures against motor vehicle exhaust gases include specific measures against carbon monoxide, hydrocarbons, and lead. Countermeasures against photochemical smog include further study, routine reduction of hydrocarbons, and special steps to be taken in emergency situations. Deodorizing facilities are planned for plants treating fish and animal byproducts. Improved surveillance facilities and methods of warning citizens of emergency conditions are planned. Locations where the air has an oxygen content below 18 percent are being identified so that preventive measures can be taken.

1971

62719 **APTIC NO. 41993**

Altshuller, A. Paul

FEDERAL PROGRAM IN AIR MONITORING TECHNOLOGY. *American Ordnance Assoc., Washington, D. C., Proc. Environ. Pollut. Meet., 2nd, Edgewood Arsenal, 1971, p. 43-51. (March 24-25.)*

Federal acitivity in the development of air monitoring technology began in 1955 but until 1967 no instrumentation was developed for needs outside the Federal operations. The instrument industry did no more than fabricate instruments designed in the early 1950 s to meet the requirements within the state of California. Since 1967, the role of the Federal government has been expanded under the mandate of the amended Clean Air Act. The Federal agencies have been successful in evaluating and developing instruments based on chemiluminescent, electrochemical, flame photometric, gas chromatographic, and optical techniques. These instruments expanded the capability for monitoring sulfur oxides, carbon monoxide, ozone, hydrocarbons, and nitrogen oxides. The important areas of need are for surveillance networks, atmospheric and plume research, biological effects field investigations, air quality standards, motor vehicle emission compositions, motor vehicle certification and assembly line testing, continued surveillance of vehicles with mileage accumulation, stationary source emission composition investigations, stationary source standards, and determination of compliance with emission standards. Instrument requirements must be anticipated very much in advance of compliance schedules. Prototype insutruments must be developed for substances for which the capability is totally lacking or inadequate such as nitric and hydrochloric acid, asbestos, polynuclear organic materials, fluorides, beryllium, mercury, arsenic, selenium, sulfates, nitrates, and organic aerosols. Convenient monitoring equipment is needed for the particle size distribution and mass loading of particulates by size range. The Federal role is now that of developing the capability to supply needed measurements by any and all means available wherever the data are required.

62720 **APTIC NO. 33803**

Goldbloom, Victor C.

THE CHALLENGE OF THE NEXT DECADE. *(Le defi de la prochaine decennie). Text in French. Ingenieur (Montreal), 270(57):3-7, Sept. 1971.*

The major objectives and the organizational structure of the public organs of the province of Quebec are described which are concerned with the protection of the environment. There are three main groups of services: The general administration for environmental hygiene; the administration of water resources in Quebec; and the general agency for equipment used in conjunction with water. The first group is involved in occupational health, air purification, water sanitation, and the effects of radioactive radiation. Its activities include studies about ventilation, ambient air, lighting, noise, and exposure of personnel to toxic substances. Sampling and testing of air provides information about air pollution which can lead to contacts with certain industries to induce reduction in some activities for a limited period of time. Automobile users may be asked to avoid driving in certain areas. Wind, air temperature, temperature inversions and pollution are measured in towers in Quebec and Montreal.

62721 **APTIC NO. 42238**

Henz, Donald J. and Richard W. Gerstle

THE PLANT ENGINEER AND AIR POLLUTION CONTROL. *Factory, 4(10): 35-36, Oct. 1971.*

To avoid the embarrassment of seeking approval for air pollution control projects on a crash basis in the near future, the plant engineer should at least know about the effect of the Clean Air Act and the generic types of current emission control regulations. While the states have primary responsibility for assuring air quality within their boundaries, development and enforcement of a compliance system is subject to federal intervention. The administrator of the Environmental Protection Agency is charged with the duty to develop and issue documents on air quality criteria and pollution control techniques, as well as to publish regulations prescribing ambient air quality standards of performance. The Clean Air Act provides for federal enforcement where a state fails to enforce emission standards adequately. The Act also gives the administrator authority to require the operator of a new or modified source to keep records, make reports, monitor, and sample for emissions. Particulate regulations and types of gaseous emission rules are mentioned, including limitations on the density of black smoke measured by the Ringelmann Chart.

62722 **APTIC NO. 43047**

Laamanen, A.

REGIONAL AIR POLLUTION PROBLEMS IN FINLAND. *Int. Air Pollut. Control Noise Abatement Exhib. Conf. (Proc.), Jonkoping, Sweden, 1971, p. 1:95 to 1:111. (Sept. 1-6.)*

The principal air pollution sources in Finland are transportation and industry, including industrial energy production and waste disposal. The emission inventory for 1970 shows the following figures: 7 million metric tons of particulates with 40, 30, and 10% contributed from housing, industry, and traffic, respectively; 5 million tons of sulfur dioxide with about equal amounts contributed from housing and industry; and 4 million tons of carbon monoxide with 90 and 10% being contributed by traffic and housing, respectively. The number of private cars/1000 inhabitants has increased from 58 to 155 over the 1960 s with the total number of automobiles below one million cars. In Finland air conservation is part of the activities of the Ministry of the Interior with the Department of Air Pollution, Toxicology, and Biochemistry of the Institute of Occupational

Health carrying out research, monitoring, and control activities in collaboration with other institutions. The national base level air station, which surveys air quality, is located at Pertunmaa in central Finland. Over the next few years, seven rural and 30 urban areas will be monitored for sulfur dioxide and suspended matter. Community air surveys monitor fine and coarse particulates and gaseous pollutants such as sulfur dioxide, carbon monoxide, and nitrogen oxides. Two mobile monitoring units, which include sampling and analytical equipment, are involved primarily with local air monitoring programs. The formation of new biomedical criteria will be attempted using population groups selected from the base level area and from densely populated urban environments. The main pollution factors investigated under this program will be asbestos and lead.

62723 **APTIC NO. 42496**

Larson, C. M.

GENERAL DISCUSSION--THE CALIFORNIA GASOLINE CORRELATION OF VEHICLE POLLUTION CONTROL AND UNLEADED GASOLINE CORRELATION TESTS. *Am. Soc. Testing Mater. Spec. Tech. Publ., no. 487:158-160, 1971. (Presented at the American Society for Testing and Materials, Annual Meeting, Toronto, Ontario, June 21-26, 1970.)*

California was the first state to crack down on air pollution from automobiles, and Toyota of Japan was the first automobile manufacturer to win California Motor Vehicle Control Board approval for an effective exhaust emission control system for 1968 models. The need to meet emission requirements has been one of the reasons for more fuel injection systems being offered on engines. Engine test procedures must now be established for lead-free gasoline. California ambient air quality standards are presented for oxidants, carbon monoxide, hydrogen sulfide, nitrogen dioxide, sulfur dioxide, visibility-reducing particles, and particulates.

62724 **APTIC NO. 43070**

Mahoney, James R.

MULTI-DISCIPLINARY TRAINING OF AIR POLLUTION METEOROLOGISTS. *Preprint, American Meteorological Society, Boston Mass. and Air Pollution Control Assoc., Pittsburgh, Pa., p. 114-118, 1971. 2 refs. (Presented at the Conference on Air Pollution Meteorology, Raleigh, N. C., April 5-9, 1971.)*

The central role of meteorology in the analysis of air pollution control requirements provides opportunities for meteorologists to make significant, general contributions to control programs and to research activities. Typical tasks undertaken by an air pollution meteorologist include preparation of short-and long-period forecasts of air quality, development of emergency control plans, evaluation of abatement programs, evaluation of single source contributions to local air pollution, analysis of air quality monitoring data, and specification of air quality monitoring systems. Air pollution meteorologists are also frequently called to provide a technical interface with other professionals in discussions concerning legislative and regulatory questions, regional planning, transportation planning, health effects studies, control agency planning, control engineering, and economic planning. Program requirements for the training of air pollution meteorologists are described briefly.

62725 **APTIC NO. 42211**

Poston, H. W.

DEVELOPING CONTINGENCY PLANS FOR AIR POLLUTION EPISODES. *Proc. Am. Power Conf., vol. 33:697-701, 1971.*

The Chicago Episode Control Plan requires the following facilities to submit action plans for controlling atmospheric emissions during periods of an air pollution Yellow Alert, Red Alert, Emergency, or Carbon Monoxide Alert: electric power generating facilities; heating facilities with over 10 million Btu/h heat input that use coal or fuel oil; public and commercial refuse disposal operations; and certain manufacturing industries employing more than 20 people at any one location, including paper and allied products, chemical and allied products, petroleum refining, stone and glass, and primary metals. Requirements for the action plan at the Yellow Alert stage include switching to low-sulfur and low-ash fuels, limiting the hours of soot blowing and boiler lancing, diverting power generation to facilities outside the alert area, and immediate compliance to present particulate emissions standards. In the Red Alert stage, production is further curtailed and all incineration is prohibited. At the emergency stage, all unnecessary use of electricity and motor vehicles is prohibited, aircraft flights are prohibited, all buildings must be maintained at no greater than 65 F, and only essential facilities and operations are allowed to remain open. If the air pollution episode is accompanied by high levels of carbon monoxide, further restrictions are prescribed.

62726 **APTIC NO. 38357**

Ruckelshaus, William D.

TITLE 40--PROTECTION OF ENVIRONMENT. CHAPTER I--ENVIRONMENTAL PROTECTION AGENCY, PART 51--REQUIREMENTS FOR PREPARATION, ADOPTION, AND SUBMITTAL OF IMPLEMENTATION PLANS: RECODIFICATION AND REPUBLICATION; CORRECTION. *Federal Register, 36(243):24002-24003, Dec. 17, 1971.*

In the recodification and republication of the regulations of the Environmental Protection Agency appearing in the Federal Register of Nov. 25, 1971, miscellaneous amendments to the former 42 Code of Federal Regulations, Part 420 were inadvertently omitted. These amendments are reprinted without change except to renumber them to conform to the new codification of Title 40 of the Code of Federal Regulations. The amendments pertain to control actions to be taken to prevent concentrations of sulfur dioxide, particulate matter, oxidants, carbon monoxide, and nitrogen dioxide from reaching levels that could have significant health effects; the levels of these pollutants at which warnings are to be issued; and the levels at which the most stringent control actions are necessary.

62727 **APTIC NO. 35274**

Wiethaup, Hans

ABOUT LEGAL PROTECTION AGAINST EMISSIONS FROM GARBAGE DUMPS. *(Zum Rechtsschutz gegen Immissionen von Muellkippen). Text in German. Gesundheisw. Densinfekt. (Hamburg), 63(5):73-77, 1971. 48 refs.*

West German regulations define garbage primarily as household scrap, kitchen refuse, empty containers, packing material, leather, straw, rubber, paper, bones, heating residues, and refuse from hospitals. In the German Federal Republic about 200 cu of garbage per year accumulate, equivalent to 3.3 cu m per person. Of this, only about 20 million cu m or 10% is being properly deposited, or brought into the 19 existing incineration plants and 11 regular compost installations. The remaining 90% ends up in unhygienic garbage dumps, of which there are some 30,000 in West Germany, except for a small percentage that is disposed of in controlled landfills. In uncontrolled dumping, the solid waste transported out of communities is being unsystematically dumped on waste heaps, in hollows, swamps, and sand pits. No supervision is provided, and there are risks involved, such as contamination of drinking water, obnoxious odors spread by wind, creation of breeding grounds for insects and rats, and fire risks. Latest regulations prescribe that such dumps must not be located at less than 500 m distance from residences and less than 100 m from highways. The right to sue and the legal protection available to property owners and tenants in case of damage or impairment as a result of emissions and other effects arising from uncontrolled dumps are described in detail.

1970

62728 **APTIC NO. 34400**

Strauss, W.

AIR RESOURCE MANAGEMENT: PLANNING AN ACCEPTABLE URBAN AIR ENVIRONMENT. *Clean Air (J. Clean Air Soc. Australia New Zealand), 5(2):19-25, May 1971. 15 refs. (Presented at the Tewksbury Symposium on the Analysis of Urban Development, Melbourne Univ., Australia, July 1970.)*

While it is unrealistic to attempt to achieve a completely unpolluted environment in a modern city, pollution can be controlled to a greater or lesser extent depending on the type of process, the effluent gas, and the location of the process. Four levels of pollution on which air quality standards can be based have been set by the World Health Organization: the level of detectable effect; sensory irritation, plant damage, and visibility effects; physiological impairment and exacerbation of chronic disease; and acute illness or death in susceptible persons. Standards corresponding to the first effect are a reasonable basis for the goals of an urban environment. A program of air resource management must form part of a general plan for urban development and should consider such factors as the presence of natural sinks (large bodies of water), natural barriers (mountains), open spaces (parks and buffer zones), and prevailing winds, and the profound influence of cities on microclimatic conditions. The setting of acceptable air quality standards for Australian cities and industrial areas is an urgent need, but far more data than the sparse measurements now available on present and future emissions are required before desired levels can be defined. Emissions from domestic heating, automobile metallurgical industry are discussed. Seasonal variations, diurnal variations, smog, humidity, cloudiness, radiation, and temperature are mentioned.

1968

62729 **APTIC NO. 36555**

Raguin, J.

PRESENTATION OF C.E.C.A. PROGRAMS FOR THE CONTROL OF AIR POLLUTION IN THE STEEL INDUSTRY. *(Presentation des programmes C.E.C.A. de lutte contre la pollution atmospherique dans la siderurgie). Text in French. Preprint, Association Technique de la Siderurgie Francaise, Paris (France), Commission Eau et Pollution Atmospherique, 16p., 1968. 21 refs. (Presented at the Association Technique de la Siderurgie Francaise, Commission Eau et Pollutin Atmospherique Meeting, Oct. 14-15, 1968, CT/MTP Service 526 No. E-PA 68-43.)*

Research projects in the field of air pollution from the steel industry over the past seven years are discussed. All proposed Association of the French Steel Industry projects must be approved by three different commissions, a lengthy process which should be shortened. Policies (financial, technical, statistical) governing research financed by Commission Eau et Pollution Atmospheric are outlined and the research studies hitherto completed are analyzed by country of origin, nature, and subject. In France, two applied projects have been carried out, one dealing with dust control of converters by bag filters, the other with wet dust control of converters. Theoretical studies dealing with measuring instruments have also been carried out. Forty-three completed research projects with names of the originating organization, size of grant, subject, short descriptionof results achieved, and the journal in which the results were published are listed. Of these projects, two deal with work safety, eight with control of red fumes, nine with work site emission measurements, three with control of siderurgical dust, seven theoretical studies deal with methods and devices for the measurement of particulate emissions, and five deal with installations for the removal of dust and purification of fumes and gases.

1967

62730 **APTIC NO. 42435**

Finch, Robert

NATIONAL EMISSION STANDARDS STUDY. *Dept. of Health, Education, and Welfare, Washington, D. C., Report to the United States Congress In compliance With Public Law 90-148 The Air Quality Act of 1967, 161p., March 1967. 137 refs.*

There is a need to ensure adoption and enforcement of emission restrictions applicable to all significant stationary sources of air pollution. Three alternative ways of meeting this need are national emission standards, extension and modification of the present system, and national air quality standards. It is recommended that the Clean Air Act be amended in such a way as to provide for adoption of national air quality standards, state adoption of implementation plans for all areas, adoption of national emission standards for all major new stationary sources of air pollution and all stationary sources of extremely hazardous pollutants, broadening of Federal enforcement authority, and streamlining of Federal enforcement procedures. (Author summary modified)

1966

62731 **APTIC NO. 42558**

Bayh, Birch

A CONGRESSIONAL VIEW OF THE PROBLEM. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 107-111. (Dec. 12-14.)*

The establishment of a goal oriented research program similar to that of the space program may be the best approach to solving the problems of automotive air pollution. The most crucial abatement needs and the type of breakthrough needed must be defined before the problem is presented to the American business and technical community. Research and development funds could be awarded to those firms presenting the best proposals for solving a specific problem. Given the size of the problem, the sums presently devoted to it are inadequate. The roles of the Federal agencies have not yet been fully defined and much remains to be done. One of the first priorities should be the establishment of a nationwide inspection program for auto exhaust emissions.

62732 **APTIC NO. 42568**

Calvert, Seymour

FEDERAL ROLE IN EMISSION CRITERIA AND STANDARDS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 472-475. (Dec. 12-14.)*

The role of the federal government in setting emission standards and criteria is reviewed. A program is needed to give local air pollution control programs all the substantive information needed to evaluate emission standards. Manuals must be written for local programs which would contain information on the effects of air pollution on biological systems, materials, esthetic qualities, and economics. Technical information on control devices and alternate processes must be circulated. Source and control economics, methods for measurement, and previous experience must all reach the local level. A guide should present philosophical principles and example standards of representative conditions.

62733 **APTIC NO. 42518**

Chalker, William R.

DISCUSSION: FEDERAL ROLE IN EMISSION CRITERIA AND STANDARDS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 476-479. (Dec. 12-14.)*

The Federal government should not take an active role in setting stack emission criteria or standards. However, their indirect activities is setting ambient air criteria; improving and extending air monitoring programs; increasing the technology on broad scale dispersion models and computerized programs; and pointing out ill-conceived types of emission standards can make the Federal government the catalyst for the states and local communities to effect more scientific emission standards.

62734 **APTIC NO. 42511**

Dingell, John D.

A CONGRESSIONAL VIEW OF THE FEDERAL ROLE IN AIR POLLUTION CONTROL. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 516-518. (Dec. 12-14.)*

With the best effort that can be made by everyone under the laws on the books, with the present standard of technological knowledge and information, the rather dreary prospect is that air pollution will not really be controlled. By the middle 1980 s, with the very best efforts, by all levels of government, industry, and others, the United States will be falling backward in handling the problems of air pollution. The Los Angeles County Air Pollution Control District accounts for over 41% of all the money spent by local agencies throughout the United States. California spends 57% of the total spent by states on air pollution. When industries engage in the manufacture of goods for profit, it is their responsibility to bear the burden of the economic waste, not project it, or inflict it, upon society.

62735 **APTIC NO. 42529**

Edelman, Sidney

FUTURE LEGAL AND LEGISLATIVE PROBLEMS IN AIR POLLUTION CONTROL AND POSSIBLE SOLUTIONS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 567-570. 12 refs. (Dec. 12-14.)*

The breadth of authority in the Motor Vehicle Air Pollution Control Act is indicative of a congressional purpose to leave no need for the exercise of state authority in the same area. There is a needed function for the states, however, in the inspection of motor vehicles equipped with air pollution control devices after sale. The effluent tax approach stems from a misunderstanding of charges imposed upon industries discharging waste into streams. Water can be treated at a central handling area for all water in a watershed. Air cannot be treated in this manner. Tax benefit programs are designed instead as an incentive to encourage the construction of air pollution control facilities. Legislative orientation for all programs must arise from a social context involving more than financial values. Respect for the rights of others is the foundation of a decent environment.

62736 **APTIC NO. 42536**

Gardner, John W.

KEYNOTE ADDRESS: NOW-FOR CLEAN AIR. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 12-16. (Dec. 12-14.)*

There is no major metropolitan area in the world today without an air pollution problem. By 1980, the urban population will increase by a third, the number of motor vehicles will increase by 40%, and energy demands will increase by 50%. Air pollution must be controlled at the source. Public concern is mounting, as reflected in a series of laws passed since the Second National Conference on Air Pollution four years ago. First to emerge was the Clean Air Act of 1963 authorizing the Federal Government to make grants for state and local control programs, and to take enforcement action against interstate air pollution. The 1965 Amendments to the Clean Air Act provided for Federal regulation of air pollution from new motor vehicles. The 1966 Amendments authorized Federal grants to help states and local agencies maintain effective air pollution control programs. Thus far $10 million in grants have been awarded to states and local agencies. Since the Clean Air Act the total funds available for state and local air pollution programs have increased 65%. Some $20 million is now invested annually. These amounts are far from adequate. Industry has begun to think seriously about the problem. Air pollution has had more scientific attention in the last four years than ever before in history, but this response is little more than a beginning.

62737 **APTIC NO. 42592**

Gilbertson, Wesley E.

THE IMPACT OF THE SOLID WASTE DISPOSAL ACT. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 285-290. (Dec. 12-14.)*

It is important to learn how to incinerate solid waste without worsening air pollution. The Solid Waste Disposal Act s most important impact ahs been the exposure of the fact that land, air, and water pollution problems are often indivisible. Federal responsibility under the Act is one of supporting other public and private agencies at the state and local level. Two Federal departments are involved. The Department of the Interior is responsible for those wastes generated by the mineral industries, where waste generation can be controlled by the extracting, processing, or using facility. All other responsiblilites under the Act are assigned to the Department of Health, Education, and Welfare. Under the Solid Waste Disposal Act the Public Health service is funding 9 projects aimed at improving solid-waste incinerator techniques. Four of the projects recover and put to use some of the vast quantity of incinerator heat now wasted. The goal of the Solid Waste Disposal Act is to manage solid waste with irreducible pollution of land, air, and water.

62738 **APTIC NO. 42543**

Huguet, James H.

STATUS REPORT: INDUSTRIAL OPERATIONS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 196-198. (Dec. 12-14.)*

The future prospects for air pollution control of specific industries would indicate that air conservation must be made part of each company s overall corporate program. The company president and board of directors must make their positions known at all levels of the organization. Industrial associations have been doing a very good job in information handling and generation. The Manufacturing Chemist s Association and the American Petroleum Institute have developed and issued statements of policy. Immediate action can result only from a directive addressed to a specific individual responsible for controlling a specific emission source. The plant manager must insist that each process operator and mechanic have an incentive to achieve good working habits in control of emissions. Guidelines for the establishment of plant control are available from many sources. Membership in the Air Pollution Control Association is necessary to be effective and current in air conservation. A positive program today will result in clean air tomorrow.

62739 **APTIC NO. 42537**

Humphrey, Hubert H.

THE PROBLEM OF AIR POLLUTION. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 3-11. (Dec. 12-14.)*

America is the world s most seriously polluted country. Air pollution seems to be taking a serious toll of human life. Air pollution is unnecessary, physically dangerous, costly, and intolerable in a democratic society. Emphysema is the fastest rising cause of death in this country today. The rate is 10 times what it was in 1950. Deaths from emphysema are twice as high in cities as in rural areas. Most of the approach to the

problem of air pollution has been on a local basis and most of the time it has been ineffective. What is needed is a working partnership among all levels of government, federal, state and local -- a partnership that must also include private industry. The need for uniform standards, increased progress in control technologies, and public support is also emphasized.

62740 **APTIC NO. 42513**

Kerner, Otto

A STATE VIEW OF THE FEDERAL ROLE. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 508-511. (Dec. 12-14.)*

The principal role of the Federal Government, specifically the Public Health Service, at the present time is that of providing financial assistance and technical aid, through research, equipment, personnel, and training, to aid with those special problems which fall beyond the resources of the various states and enforcing air pollution laws where interstate pollution is involved. Air pollution problems, however, should be handled at as local a level as circumstances permits.

62741 **APTIC NO. 42522**

Low, Robert A.

LOCAL AND REGIONAL AIR POLLUTION CONTROL PROGRAMS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 616-619. (Dec. 12-14.)*

The opinions and conclusions of a panel on local and regional air pollution control programs are reviewed. The number of recommendations for regional control was equal to the number of participants, and specific views of specific panelists are given. There was a central theme of dissatisfaction with present regional control efforts. A coordinated program by local, regional, state, federal, and international agencies is called for. Four times the present effort is needed if success is to be expected. Air pollution programs must lead, not follow, the development of control hardware. Legislators must have the knowledge and insight to provide the legislation which should anticipate tehcnological progress.

62742 **APTIC NO. 42516**

McKee, Herbert C.

DISCUSSION: FEDERAL ABATEMENT OF MAJOR INTRASTATE AIR POLLUTION SOURCES. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 487-490. (Dec. 12-14.)*

The problems in controlling air pollution, by their very nature, establish principles which indicate the appropriate level of government to perform the varied tasks. For intrastate problems, the responsibility is at the Federal level; for other problems, it will be at state levels; and for some it will be at local, city, or county government levels. An adequate study of the present and future problems will indicate where the authority and responsibility will reside.

62743 **APTIC NO. 42580**

Mitchell, H. Clifford

DEVELOPING AND ESTABLISHING NEW LOCAL OR REGIONAL AIR POLLUTION CONTROL PROGRAMS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 405-409. (Dec. 12-14.)*

Experience in metropolitan St. Louis in the development of a bistate air pollution program dictates procedures that could be followed elsewhere. Air quality goals and emission levels are proposed by experts after the collection of a wealth of information. The control approach must be discussed thoroughly with representatives of industry and local and state governments. Large metropolitan complexes need uniform regulations. Finally, when a metropolitan area cuts across state boundaries, interstate cooperation is needed in the drafting and passing of control ordinances.

62744 **APTIC NO. 42573**

Nelson, Gaylord

A CONGRESSIONAL VIEW OF THE PROBLEM. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 450-453. (Dec. 12-14.)*

Air pollution is just one part of the massive threat which faces all resources. There is a real question whether the nation will be flexible enough to combat population growth, industrialization, urbanization, and scientific technology. The survival of mankind depends on actions now and in the near future. At present, relatively few states have strong anti-pollution programs. The Federal government s role consists of making grants to local air pollution agencies so that they can operate their own programs. The states are presently spending $5 million and communities are spending $15 million. The Federal Clean Air Act makes $46 million available for the fiscal year 1966.

62745 **APTIC NO. 42528**

Phillips, William J.

FUTURE LEGAL AND LEGISLATIVE PROBLEMS IN AIR POLLUTION CONTROL. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 571-573. (Dec. 12-14.)*

Immediate air pollution control implies bold new action, massive public education, and social adjustment. In one California county, motor vehicle registration increases at a rate of 10.6%/yr; the corresponding population increase is 4.2%. A crash program for air pollution control measures must be started. California is taking the substantial threat approach. The State Department of Public Health has been asked to define that level of contaminants that constitutes a substantial threat to public health or to protection of persons or property. A state highway patrol with a coordinated motor vehicle department could provide adequate testing and the issuance of stickers according to national standards. Guidelines can best be enforced by local agencies, with help from industries and chambers of commerce. Working at air pollution as a crash program, and not just thinking about 1980 as a target, is necessary for success.

62746 **APTIC NO. 42533**

Rihm, Alexander, Jr.

DISCUSSION: REGULATION OF NEW MOTOR VEHICLES. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 61-63. (Dec. 12-14.)*

Annual inspection of emission control devices is recommended as a state supplement to federal regulation. Federal regulation of diesel engines has been overlooked. It is recommended that emissions from diesels be limited so that smoke density that limits visibility by more than 20% be permitted for no more than 5 sec at a time and idling be limited to 3 min when not in use performing the vehicle s intended function. Some areas may need more stringent emission standards than others. Research on emissions and driving cycles must be planned. The automobile industry is urged to develop exhaust controls so that standards can be writted for individual vehicles and automobile owners will get what they are paying higher vehicle prices to obtain.

62747 **APTIC NO. 42517**

Rossano, A. T., Jr.

FEDERAL ABATEMENT OF MAJOR INTRASTATE AIR POLLUTION SOURCES. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 480-486. 12 refs. (Dec. 12-14.)*

In a nation as vast and complex as the United States, it is difficult to achieve effective and satisfactory centralized air pollution control at the Federal level. The chief argument for local control is that abatement programs should be fitted to local needs, desires, and resources. It is not unreasonable to expect the Federal government to extend its control of air pollution to those private facilities which have Federal grants. Public works, financed with Federal funds may come under some form of Federal control. The Federal government is already active in intrastate air pollution abatement, and for the most part such involvement has been beneficial, and, in specific cases, indispensable. The first choice, however, should be effective and reasonable local action now to forestall the need for further Federal involvement later.

62748 **APTIC NO. 42514**

Schrunk, Terry D.

A LOCAL VIEW OF THE FEDERAL ROLE. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 503-507. (Dec. 12-14.)*

The Federal role in air pollution control is primarily that of a prime mover in sponsoring the broad and expensive research and development required to identify air quality goals designed to protect human health, reduce property damage, and restore the desirable attributes of a clean safe urban air supply. The role of the local and regional governments is to control and prevent air pollution throughout the community. There is no general criticism of federal program activities, or their administration. Most states are unable to provide leadership to the urban areas. There is a critical shortage of technical manpower at the community level and a lack of local and state public informational programs. Local planning and zoning to prevent air pollution is difficult. Because of failure to provide solutions to unique air pollution problems, urban governments and the Federal governments will be forced to fill the void created by lack of responsible state activity in the area of prevention and control. This development is undesirable and should be avoided.

62749 **APTIC NO. 42594**

Seelig, Richard P.

DISCUSSION: REGULATION OF USED MOTOR VEHICLES. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 66-69. (Dec. 12-14.)*

Emissions from used motor vehicles present a formidable problem from the administrative, political, economic, and technical points of view. When used cars are controlled, a purification effect in the atmosphere would be noticed in 3 or 4 years. It will be 10 or 15 years before an effect will be important as a result of the new-car control program. If a gasoline tax were employed to raise money for the purchase and installation of anti-pollution devices on used cars, the cost to the motorist becomes directly proportional to the gasoline he uses and to the pollution he creates. The savings accruing to agriculture alone, where damages from smog costs have been estimated at $100 million a year, would probably offset the annual cost of the program.

62750 **APTIC NO. 42521**

Stanley, William J.

ROLE OF FEDERAL GOVERNMENT IN AIR POLLUTION CONTROL. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C. 1966, p. 620-621. (Dec. 12-14.)*

The Federal government should be responsible for establishing air quality criteria because only the Federal government is relatively free from pressures that have been exerted on local government and have served to cripple the setting of effective criteria. The Federal government should publish manuals that would present suggested emission standards based on a variety of local conditions and should delegate enforcement of regulations for nation wide industries to state and local officials to allow a certain amount of flexibility for local conditions. It may be expedient to establish interstate airshed controls first and intrastate regions later. Efforts appear to be lagging behind technical capabilities and new forms of government ought to be tested to handle the problems.

62751 **APTIC NO. 42530**

Stern, Peter M.

DISCUSSION: PLANNING AND ZONING: CAN THEY BE MADE TO WORK FOR CLEAN AIR? *Public Health Service, Washington D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 558-559. (Dec. 12-14.)*

Land use planning and zoning cannot and should not be offered as alternatives to controlling pollution at the source. A downwind industrial district with a buffer zone is difficult to maintain in the fluctuating conditions of industrial real estate. A community may have to consider taxing unimproved land in such a district to restrain land speculation and encourage orderly development. Expansion of such an industrial area is inevitable. Zoning for industry is therefore more a tool for industrial development than for land-use and pollution control. The key to successful development is to convince the local unit of government to accept land-use planning and zoning before population pressure and speculation interfere with productive utilization of strategic property. Land-use planning and zoning are better adapted to rural rather than urban implementation.

62752 **APTIC NO. 42515**

Stites, Joseph G., Jr.

FEDERAL SUPPORT FOR INDUSTRIAL AIR POLLUTION CONTROL METHODS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 499-502. (Dec. 12-14.)*

Governmental agencies cannot grant money for research on air pollution without maintaining control over the project. Industry should first decide whether it is willing to relinquish or assign this control. Since Federal agencies perform an excellent public relations function, a successful research program would result in favorable publicity. Larger sums of money would be available from Federal agencies. Federal support would allow a broader base of creative solutions and evaluations, and the risk of failure would be minimized. A lead time of 18 months to 2 years is necessary for clearing appropriations. If Federal assistance is being sought to underwrite research for a commercial venture with the idea of developing a unique competitive position, the structure of Federal funding is prohibitive. If a company has a unique problem, then it should be the responsibility of that company to solve its problem. Federal agencies can assist by defining realistic goals and schedules.

62753 **APTIC NO. 42512**

Thayer, Harold E.

AN INDUSTRIAL VIEW OF THE FEDERAL ROLE. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 512-515. (Dec. 12-14.)*

Cleaning the air up on time means, to industry, cleaning the air before public impatience results in dumping the entire air pollution problem in the Federal lap. The Federal responsibility involves adequate funding of research facilities and leadership. New laws are not needed. Technology must be developed to allow compliance with present laws. The design, engineering, fabrication, and installation of control devices must be industry s responsibility. There should be some recognition that the investment in control facilities, while having social benefits, does not contribute to profits.

62754 **APTIC NO. 42571**

Tukey, John W.

STATUS REPORT: ROLE OF THE FEDERAL GOVERNMENT IN AIR POLLUTION CONTROL. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 462-464. (Dec. 12-14.)*

Both public concern with air pollution and the Federal program have grown at a rapidly increasing rate. The first Federal legislation in 1955 was a supplement to the Public Health Service Act. Congress appropriated almost $2 million for the first fiscal year of the new program. Successive laws, including the Clean Air Act in 1963, have continued to strengthen and broaden the Federal role to fit its responsibility. Appropriations reached $35 million for 1967 and $74 million is budgeted for 1969.

1961

62755 **APTIC NO. 67142**

Linsky, B. and G. Aase

FOUNDRY AIR POLLUTION CONTROL IN THE SAN FRANCISCO BAY AREA. *Mod. Castings, 40(5):111-116, Nov. 1961. 3 refs.*

A discussion is given of the basic needs of the San Francisco Bay Area Air Pollution Control District, covering such items as localized effects and terrain of the District, the meteorological and climatic conditions that prevail in the area, pollutant measurements which have been made, and a survey of the total emissions. An initial study surveyed air pollution control regulations adopted in other areas and included discussions with eminent professional people in the air pollution field. Concepts and principles were discussed in many meetings with interested industry groups, and the first draft of Regulation 2 was made. A condensed version of Regulation 2 is presented, covering the five classes of source operations, general limitations, and some of the features not found in other regulations. Sampling methods are included as part of the regulation. Sections of particular interest to foundry operators are reviewed. A literature review of the main emission source operations in foundry practice is presented, giving a chemical and physical description of these emissions and ways to estimate the emissions. Controls being installed to meet the emission limits are shown, including a breakdown of foundry source operations with a description of the control method or methods being used or installed. Some of the problems which have been encountered are mentioned. The control of organic vapors from core ovens and similar operations is part of future trends. An increased coverage of foundry floor operations, a discussion on expected technical advances in operating practices and control methods, is presented. (Author abstract modified)

1959

62756 **APTIC NO. 45783**

LEGAL NOTE...LIABILITY FOR AIR POLLUTION. *Public Health Rept. (U. S.), 74(2):104, Feb. 1959. 1 ref.*

In the case between the Reynolds Metals Company and Yturbide, the plaintiffs claimed they were poisoned by fluorides originating from the plant of the defendant. Their injuries were found by a jury to have been caused by excessive emission of fluorides by the defendant s plant. On appeal by the defendant the court of appeals, sustaining the verdict for the plaintiffs, held that the defendant s evidence of reasonable care in operation of the aluminum reduction plant was not sufficient to rebut the presumption that the excessive emission of fluorides was attributable to the defendant s negligence. A finding that excessive amounts of fluorides were deposited on the plaintiff s property from the plant whose construction, operation, and maintenance was under the exclusive control of the defendant could reasonably be accepted as circumstantial evidence of negligence.

1956

62757 **APTIC NO. 40216**

Griswold, S. Smith

SMOG PROBLEM IN LOS ANGELES COUNTY. *Ind. Wastes, vol. 1:255-259, Sept.-Oct. 1956. (Presented at the Annual Southern California Conference on Elimination of Air Pollution, 1st, Los Angeles, Calif., Nov. 10, 1955.)*

The organization, inspection and enforcement program, objectives, and accomplishments of the Los Angeles County Air Pollution Control District are reviewed, and some of the control measures it has instituted are summarized, including regulations to control rubbish burning from all sources and evaporation losses from gasoline storage and distribution. Loopholes in existing legislation are also being eliminated. Participation of the Federal and State governments in the research program of the district is being secured, and the aim of the program has been revised away from an investigation of the general nature of smog practical, tailor-make control programs for each source, e.g., the petroleum and steam power industies. Extensive research is also underway on all aspects of automotive emission control. A public information program and smog alert system are noted.

1955

62758 **APTIC NO. 43007**

Douce, W. C.

THE AMERICAN PETROLEUM INSTITUTE S ACTIVITIES IN THE FIELD OF AIR AND WATER POLLUTION ABATEMENT. *Oklahoma Eng. Exp. Sta. Publ., no. 97, 23(1):55-61, Dec. 1955.*

The American Petroleum Institute has conducted work on pollution problems since 1921. With the formation of the Committee on Disposal of Refinery Wastes within the Division of Refining in 1930, action on waste control in the industry was vigorously promoted. The committee has published a five-volume manual on sources, types, and recommended methods of disposal of refinery wastes and has sponsored fundamental research work on the design of gravity oil-water separators, the effects of refinery wastes on aquatic life, air pollution, and the design of disposal equipment. Revisions of the manual are continually undertaken with many new topics discussed. Current research projects sponsored by the committee concern the applicability of a bio-assay method to natural bodies of water typical of those into which the petroleum refineries discharge wastes, the determination of the effects of long-time exposure to extremely low concentrations of fluorides in the atmosphere, the organization of available information on dust collecting devices, and the critical evaluation of available data on the acute and chronic toxicity for man and animals of selected chemical pollutants found in waste streams from petroleum refineries. In addition, much work has been done by the committee on air pollution, especially in California. With the growth of the petroleum industry, stronger abatement measures appear inevitable; however, final solutions to some of the more complex problems will take time and will be expensive.

SOCIAL ASPECTS

1976

62759 **APTIC NO. 82724**

Anderson, Scott J., Bruce W. Gardner, Betsy J. Moll, Guy L. Tribble, III, Thomas F. Webster, Kent R. Wilson, and Michael J. Zyda

CORRELATION BETWEEN AIR POLLUTION AND SOCIO-ECONOMIC FACTORS IN LOS ANGELES COUNTY. *Preprint, California Univ., San Diego, Dept. of Chemistry and California Univ., La Jolla, Energy Center, 31p., 1976. 9 refs.*

The correlation between air pollution dosage and socio-economic status is analyzed for Los Angeles County by comparing air pollution data for 1970 with 1970 census data. Air Pollution data from 14 monitoring stations are analyzed both in terms of total oxidant and in terms of an average air quality index based on a weighted function of total oxidant, carbon monoxide, nitrogen dioxide, sulfur dioxide, and particulates. Census derived socio-economic data are aggregated to 31 statistical areas of the county. Although air pollution and socio-economic variables show widely ranging spatial patterns, there is little correlation between the two. Air pollution dosages show only a small variation among 37 categories in nine socio-economic variables, and there is no evidence that Los Angeles County housing and rental prices significantly reflect air quality differences. (Author abstract modified)

62760 **APTIC NO. 82013**

Bladen, W. A. and P. P. Karan

PERCEPTION OF AIR POLLUTION IN A DEVELOPING COUNTRY. *J. Air Pollution Control Assoc., 26(2):139-141, Feb. 1976. 7 refs.*

A study was conducted on the perception of air pollution hazard in the Chotanagpur industrial area of India. Using a modified version of the standard natural hazard research questionnaire, socioeconomic, religious, and other attributes of the 350 interviews were identified, and their responses about the perception of the air pollution problem were recorded. All of the six industrial towns included in this survey shared a relatively serious air pollution problem from the mineral and heavy metal industries of Chotanagpur. The survey suggested that awareness of air pollution and its perceived danger to health were widespread in the six industrial towns of Chotanagpur. However, the high level of awareness of pollution in Chotanagpur was not accompanied by concern for the air pollution problem. Because of their preoccupation with difficult economic and social problems, most people in Chotanagpur showed relatively little concern for the air pollution problem. Differences existed among the various cultural groups living in Chotanagpur in their definition of the air pollution problem. These differences in perception among cultural groups were perhaps manifestations of the unique psychological and philosophical traits of each group. The important role of cultural traits as they affect perception were thus illustrated. The results do not reveal a marked difference in the public s reponse to air pollution between the developed and developing countries. (Author abstract modified)

1975

62761 **APTIC NO. 79718**

Berry, Michael

THE POLITICAL ECONOMY OF THE POLLUTION SOLUTION: A REVIEW ARTICLE. *Clean Air (J. Clean Air Soc. Australia New Zealand), 9(1):2-7 and 16, Feb. 1975. 11 refs.*

Political and socio-economic aspects of air pollution control are reviewed. Topics discussed include: the role of sectional interests in political decisions concerning air pollution, the viewpoint of ecologists versus that of economists, and the inherent bias of city politics against the provision of collective goods such as clean air. The political influence of polluters is also discussed.

62762 **APTIC NO. 76584**

Ledbetter, Joe O.

CAN WE AFFORD ZERO POLLUTION RISK? *Water Sewage Works, 122(9):104-105, Sept. 1975. 5 refs.*

The issues involved in achieving zero pollution are discussed. The environment can safely assimilate at least small amounts of pollutants. Pollution controls should be instituted at reasonable levels that will prevent the real effects of esthetic insult and materials and vegetation damage without giving health effects as the reason for control. The pollution control level must be somewhat above zero because removal of the last vestige of pollution is ruinously expensive. The proper level of pollution control must be justified with a balance of sociological desirability, technological capability, economical feasibility, and environmental assimilability. Zero pollution risk can be afforded if there is a threshold of risk that is well above zero concentration of pollution. Zero measurable levels cannot be achieved, even with sophisticated modern equipment.

62763 **APTIC NO. 76222**

Martin, Charles G.

THE PRACTICAL POLITICS OF AIR POLLUTION ABATEMENT. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975. p. 622-636. 11 refs. (Feb. 17-21.)*

A sampling of groups interested in air pollution abatement is presented based on a classification of the authors of papers presented at large conferences on air pollution. A typical example involving 235 papers presented at the 2nd International Clean Air Congress of December 1970 reveals that the Congress organizers classified the material presented as follows: 29 surveys, 30 papers on medicine and biology, 51 papers on chemistry and physics, 56 papers on engineering, 42 papers on meteorology, and 27 papers on administration. Papers on air pollution are also classified by the interest group of the author and the use which is likely to be made of the information. Interest groups considered include: enforcers, the public, and researchers. The interrelationships and activities of these groups and the cost-effectiveness of their contribution to the public good is discussed. (Author abstract modified)

62764 **APTIC NO. 76497**

Newill, Vaun A.

HEALTH EFFECTS AND ENERGY CHOICES. *J. Air Pollution Control Assoc., 25(9):914-917, Sept. 1975.*

The relationship between the costs of health protection and air pollution control are discussed. There is a minimum of health protection that all societies should require. An increase above the minimum is purchased at an increase in air pollution control costs. Infinite health protection is unattainable. Society must either decide what level of health risk is acceptable, a decision that will be reflected in the societal requirement to invest in air pollution control, or the decision will be made indirectly since the societal investment in air pollution control determines the level of health protection that will be achieved. There are two major problems. For some substances there is no such thing as no risk of health. Another problem relates to the effects of establishing an air quality standard for fine particulates. A strategy for fine particulate control requires that the similarities and differences of the pollution content in the different regions and of the chemical reactions that take place in the atmosphere be understood.

1974

62765 **APTIC NO. 82087**

Berglund, B., U. Berglund, and T. Lindvall

SCALING OF ANNOYANCE IN EPIDEMIOLOGICAL STUDIES. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 119-144. 28 refs. (June 24-28.)*

The measurement of annoyance evoked by environmental agents often involves survey techniques. Specific problems, such as effects of response criteria and comparability between population responses, are not well solved by using the assumptions behind the traditional survey methods. The introduction on modern scaling techniques can provide the necessary improvements. Investigations of general annoyance with regard to pulp mill odors and aircraft noise demonstrate that it is possible to measure the population response criteria as well as the population response as such. Guidelines are given for annoyance measurements that result in calibrated measures permitting comparisons between differently exposed areas, that fulfill the assumptions for commonly used statistical procedures, and thus enable the determination of meaningful dose-response relationships. (Author abstract modified)

62766 **APTIC NO. 79277**

Flesh, R. David and Amos Turk

SOCIAL AND ECONOMIC EFFECTS OF ODORS. *In: Industrial Odor Technology Assessment. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 4, p. 57-74. 18 refs.*

Problems involved in the measurement of social and economic effects of odorous air pollutants are discussed. Topics covered include: the use of attitude surveys to identify community odor problems, discrepancies between the results of attitude surveys and odor complaints, and the need for dose-response relationships. Survey and odor complaint data are presented for selected areas in the United States and confirm that odors are at least a source of annoyance to people. Studies conducted in California on both the annoyance and health aspects of odor problems confirm the existence of a dose-response relationship.

62767 **APTIC NO. 82505**

Tokyo Metropolitan Government, General Affairs Bureau

PUBLIC OPINION CENSUS ON AUTOMOBILE EMISSION GAS REGULATIONS. *(Jidosha no haishutsu gasu kisoku ni kansuru seron chosa). Text in Japanese. p. 34-35, Oct. 1974.*

A public opinion survey was conducted in Tokyo from Oct. 9-13, 1974, randomly interviewing 1500 persons over 18 years old, in order to find out Tokyo citizen s reactions to problems surrounding the 1976 Air Pollution Control Law, and other air pollution measures. There were 1122 returns (74.8%); 75 (5.0%) refused to answer. Tokyo was divided into the center of town, the residential area, the commercial area, and the suburban area. Only a little over 30% of the people thought automobiles had some positive use, while 44.5% thought they were the cause of photochemical smog and other air pollution, 28.3%, the cause of traffic accidents, and 24.3%, the cause of noise. Those who thought Tokyo air was greatly polluted totaled 61.4%; 29.9% thought it a little polluted, but of these, 47.9% thought it could not be helped since Tokyo is a large city, while 47.0% thought it could be helped. Those who thought that exhaust gas from automobiles was the cause of photochemical smog totaled 83.7%. There were 58.3% who knew something about the Muskie version of the Japanese Clean Air Act, and 61.7% thought that the Environment Agency should go ahead with implementation of the act however difficult it might be techincally; 77.6% thought that, rather than industrial development, human health must be respected, and therefore that the law should be implemented without delay; 50.2% of the people thought that this could not be technically impossible, although the automobile industry maintains that it is. As to low pollution cars, 18.2% thought they should pay a lower tax, and 15.6% thought that only low pollution cars should be operated when photochemical smog is anticipated. A heavier tax on automobiles was favored by 42.9%. Nineteen % used cars more than 4 times a week, 32.6% had driver s licenses, 32.6% owned cars; of those, 53.0% had bought it because they needed the car for their business, 19.4%, for commuting or going to school.

1973

62768 **APTIC NO. 81972**

Fiorina, Morris P.

PUBLIC OPINION AND POLLUTION: AN INTERPRETIVE SURVEY. *California Inst. of Tech., Pasadena, Environmental Quality Lab., National Science Foundation Grant GI-29726, Rept. EQL-9, 45p., July 1973. 31 refs.*

A review of public opinion polls on environmental pollution is presented. Concern over environmental degradation is relatively high and is increasing. The percentages of respondents regarding air pollution in their area as being very serious during 1970 were 51% (Northeast), 33% (Midwest), 20% (South), and 42% (West). Corresponding percentages for the year 1965 were 20%, 8%, 3%, and 13%, respectively. Environmental concerns rank second only to economical and social issues, and a majority of Americans believes that environmental programs receive too little attention and financial support from the federal goverment. Americans are willing to pay a considerable amount for a clean environment, but not through personal taxes; rather, they support raising the cost of production and consumption of polluting products. A decidedly upper middle-class bias of the environmental movement appears to enhance the possibility that other elements in society may react against it. (Author conclusions modified)

1972

62769 **APTIC NO. 40847**

WHAT DO YOU REALLY THINK ABOUT POLLUTION? *Chem. Eng. Progr., 68(2):25-28, Jan. 1972.*

A survey was conducted among chemical engineers to gauge their opinions on the state of air pollution problems and controls. They felt that pollution conditions were improving and that strict enforcement of regulations by government agencies was the best way to get companies moving. Also 94% of the replies in the survey approved a proposal for increased enforcement of existing laws. Slightly one half (55%) of the engineers felt that they were poorly prepared by their schools to meet the technological challenges of pollution control. Lack of concern by individuals was accepted as the main cause of environmental decay. A code of ethical practices was indicated as necessary. The federal government should set legal pollution standards.

1971

62770 **APTIC NO. 42497**

Clarenburg, Louis A.

PENALIZATION OF THE ENVIRONMENT DUE TO STENCH. A STUDY OF THE SUBJECTIVE EXPERIENCE OF THE POPULATION. *Preprint, 33p., 1971 (?). 9 refs.*

A mathematical model is developed as an aid in quantitatively describing the subjective experience of the population living in the vicinity of a chemical industry. During 1970, over 17,000 complaints were received in the Rijnmond area in the Netherlands, the majority related to odorous pollution. As the presence of stench interferes with mental well-being, to approach the problem from the subjective experience of the population may contribute to new insights which aid regional planning. Stench is used as a composite name for a great number of unknown odorous compounds.

1966

62771 **APTIC NO. 42535**

Dixon, James P.

THE STATE OF OUR ATMOSPHERE. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 18-22. (Dec. 12-14.)*

Science tells us that in the light of present knowledge, prediction of the capacity of the atmosphere to accommodate waste is an indeterminate problem. Common sense dictates that there are already circumstances under which the capacity is being exceeded. In searching for solutions or amelioration of the problems of air pollution, the fundamental political and social problem of building infra-structures -- building ways in which the values which are held by the person on the street, can in some way be connected with the social and political apparatus which is designed to apply the best science at any one point in time must be underscored. It becomes necessary to find ways in which the values of the consumer can be confirmed by knowledge and information which he does not possess for himself in a democratic structure which permits public response to his concerns. The major pollutants, emission sources, effects of pollution on human health, animals, plants, and materials, and socio-economic aspects of the problem are discussed.

62772 **APTIC NO. 42527**

Fogarty, John E.

A CONGRESSIONAL VIEW OF THE ECONOMIC AND SOCIAL ASPECTS OF AIR POLLUTION. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 582-585. (Dec. 12-14.)*

The environmental conditions under which an increasing majority of Americans are required to live are not inevitable. Governments have a responsibility for the health of their people which can be fulfilled only by the provision of adequate health and social measures. There exists a disparity between damage and control costs. Adequate control is available for about 11 cents/capita, whereas damage costs $65/capita. In the equitable distribution of costs and benefits, the social sciences can make a great contribution to the solution of community air pollution problems. Intangible costs, such as the cost of creating neighborhoods where keeping a house freshly painted is too discouraging and too expensive to be worthwhile, are, nevertheless, real costs of air pollution. People must become aware of what is happening to their precious environment.

62773 **APTIC NO. 42509**

Howes, Robert G.

STATUS REPORT: ECONOMIC AND SOCIAL ASPECTS OF AIR POLLUTION CONTROL. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 526-528. (Dec. 12-14.)*

A panel on the economic and social aspects of air pollution control was convened to examine how to isolate, then integrate in cost- benefit, what it will take in money, government, and adjusted human habits to cleanse the air. A complex of societal questions were studied and varied conclusions were reached. The problem of air pollution control is not static, nor is its projected growth a gentle curve. Massive infusions of funds and intellect are needed to keep even with, much less reduce, the multiplying problems. In addition to better machines, a systems approach at the local, regional, and federal levels is required. There must be a smooth transition from conference to action.

62774 **APTIC NO. 42520**

Howes, Robert G.

ECONOMIC AND SOCIAL ASPECTS OF AIR POLLUTION CONTROL. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 622-624. (Dec. 12-14.)*

The degree of sophistication in current air pollution cost estimates, planning and zoning as part of air management, the relative utility of regulation, the relationship between air management and other environmental problems, and the health costs of pollution are reviewed. Effective air management will impose significant costs in the public and private sectors as well as on the single citizen. These costs will be far less than the geometrically progressing damages which clearly threaten if such management is not undertaken now. All industries are becoming increasingly sensitive to the fact that an essential corollary to man's right to clean air is that no organization has the right to pollute the atmosphere. Pollution should figure with poverty as a principal target in the first model city grants. The nation should no longer submit to the short changing of its right to environmental decency.

62775 **APTIC NO. 42507**

Konheim, B. Brand

HOW IS AIR POLLUTION AFFECTING ESTHETIC VALUES IN THE UNITED STATES? *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 551-553. (Dec. 12-14.)*

No aspect of dirty air so motivates public anger as its assault on the senses. In New York City numerous buildings, art treasures, plants, and people suffer from the disintegration of the air. The general gray and the decreased sunlight create a kind of rainy-day- syndrome. Public opinion surveys indicate that dirty air is second only to poor public schools as a factor which drives young middle income people from urban centers. Esthetic factors are rarely the factors which motivate the experts but they are what motivate citizens. Citizens must create a climate of opinion upon which the leaders of industry and government must act.

62776 **APTIC NO. 42510**

Lewis, Howard R.

A TIME FOR IMAGINATION. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 521-524. (Dec. 12-14.)*

In New York, air pollution control has not captured the imagination of the public. It is only by getting to the emotions that progress toward a solution to air pollution will be achieved. People must be convinced that they have a life stake in air pollution control. There are individual public-spirited companies, but industry by itself cannot be relied upon to be a good neighbor. Air pollution crosses political boundaries. In its present degree, it is a whole new problem, but only traditional political mechanisms are available to deal with it. The installation of uniform controls is necessary to eliminate the competitive advantage of non- compliance.

62777 **APTIC NO. 42553**

Peterson, Esther

AIR POLLUTION AND OUR WELFARE. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 32-36. (Dec. 12-14.)*

Air pollution strikes at three important aspects of our personal welfare as consumers. Air pollution affects the price we pay

for goods, the quality of our existence, and our health. The economic cost of air pollution enters into what we pay for food, for house maintenance, automobile upkeep, and laundry. Some of the costs are hidden. Air pollution costs $65/yr/person. Deterioration of the quality of life can be measured. A study in 1927 in New York City showed that the loss of light due to smoke was sometimes more than 50%. Throughout the year, almost a quarter of the sunlight was blocked by smoke. Health and safety are affected by reduced visibility, not to mention the contribution of dirty air to the rising incidence of chronic respiratory diseases. The total cost of all local control programs is estimated at only 15 cents/person/yr. Cleaner air could help prevent illness, open our view of blue skies and of too many horizons now shrouded in smog; it could pierce the gloom that smothers many of our cities.

62778 **APTIC NO. 42552**

Walker, Eric A.

AIR POLLUTION AND OUR TECHNOLOGY. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 27-31. (Dec. 12-14.)*

The process of increasing specialization has been a practical necessity in our efforts to keep pace with the accelerating growth of knowledge. Specialization has produced artificial barriers between our common efforts toward a better life. There has been no success in applying systems analysis to the very large scale socio-technological problems of our times. Clearly, continued and expanded research on the technological aspects of air pollution will be needed for a long time to come. Better channels of communication among all those who have a role in a coordinated attack on the problem are necessary. The problem demands communication between the technologists and the political, legislative, and administrative leaders. An extensive and intensive program of public education is also needed. Without public awareness, any attack on pollution will be severely hampered. Techniques for systems management must be expanded and developed so that social, legal, and political inputs to the problem are involved.

1915

62779 **APTIC NO. 40592**

Dutton, C. B.

A DETAILED STUDY OF STATEMENTS OF RESIDENTS OF THE SELBY SMOKE ZONE AS REGARDS THE PRESENCE OF A NUISANCE IN THE AREA. *Bull. Bureau Mines, no. 98:338-380, 503-520, 1915. 86 refs.*

Complaints by residents of the Selby smoke Zone in California with respect to the production by the Selby plant of smoke, fumes, and gases offensive to the senses and destructive to the property are examined. Investigations were conducted relating to the conditions outside of Benicia and in the city proper. Claims by the ranchers regarding conditions in 1912-1913 suggested an improvement on conditions 3-7 yrs prior; prejudice against the plant and members of the commission was widespread, but the general statement that conditions are not bad at all is applicable. The more offensive odors in the past were attributable to oil works just below the plant and not to the smelter itself, even though sulfur dioxide was noted at varying times by highly sensitive persons. With the exception of one witness, none of the ranchers claimed to have lost any stock due to smelter emission, and only some claimed to have lost horses. The descripiton of the symptoms of the stock, however, suggested tuberculosis. There was no evidence that the smelter smoke was injuriously affecting orchards, trees, land, or crops. Witnesses interviewed within the city agree that the conditions were satisfactory, if the smelter continued to be operated as it had during the year. Fumes noted in the early morning constituted the greater part of the alleged nuisance and were probably attributable to the oil plant. Damage to vegetation, due to smut, stock, screens, and wires was inconclusive. Psychological considerations and recommendations are presented.

GENERAL

1976

62780 **APTIC NO. 83758**

Riethmann, H.

STACK DESIGNS FOR OIL FIRING SYSTEMS. *(Schornsteinausfuehrungen fuer Oelfeuerungsanlagen). Text in German. Oel Gasfeuerung, 21(1):19-21, 1976.*

The functions and problems relating to stacks are reviewed. Critical factors in stack design include the absence of sharp bends, an upward slope of at least 10% from boiler to chimney, and selection of acid- and heat-resistant materials. Stainless steel can be used for the metallic parts. It is important that stack temperature not drop below 338 C, at which temperature sulfuric acid condenses and is corrosive to the inside wall. In general, exhaust gas velocities above 20 m/sec are to be avoided as gases may be forced into pores, and if the gases contain H_2SO_4 they will damage metal and ceramic parts.

62781 **APTIC NO. 83306**

Schneider, Hans Wilhelm

PHOTOCHEMICAL SMOG: MORE AND MORE A GLOBAL PROBLEM. *(Photochemischer Smog: Mehr und mehr ein globales Problem). Text in German. Umwelt (Duesseldorf), 6(1):31-32, 1976.*

Studies and observations on photochemical smog are reviewed. After the first observation of photochemical smog in the Los Angeles area more than 30 years ago, such smog was observed subsequently in San Francisco, New York, the Netherlands, Japan, Canada, West Germany, France, England, Italy, Yugoslavia, Sweden, USSR, and Australia, indicating that this phenomenon is becoming an increasingly global one. Apart from a monitoring system of 11 sampling stations, the effects of photochemical smog are studied in the Netherlands by means of indicator plants such as petunia, potato, nettle, spinach, tomato, alfalfa, and tobacco, which are particularly sensitive to ethylene, ozone, peroxyacylnitrates, and nitrogen dioxide. While ozone damages rubber products due to oxidation, oxidants seem to retard the corrosion of steel. The concentration standards on ozone and oxidants are often exceeded in the Netherlands and in West Germany, but the NO_2 concentrations are usually far below the maximum allowable level.

1975

62782 **APTIC NO. 76321**

Clayson, Reed L., Edith Briggs, and William J. Veigele

SUPPLEMENTARY CONTROL OF SO2 IS PRACTICAL AND COST-EFFECTIVE. *Power Eng., 79(12):60-63, Dec. 1975.*

Static and dynamic methods of controlling ambient sulfur dioxide levels are discussed in relation to the Colorado proposed 1978 emissions standard for SO_2. Many Colorado power plants can meet the emission standard of 150 ppm only by the use of SO_2 scrubbers. An alternative approach to control would be to reorient the emission standard to regulate the amount of SO_2 that could be discharged per unit time. Increasing effective stack height is at least as effective as installing scrubbers. Rsising the effective stack reduces ambient concentrations of other pollutants emitted by the power plant whereas installation of scrubbers reduces primarily the SO_2 concentrations. Installation of scrubbers for SO_2 commits the power plant to high fixed capital and operating expenditures regardless of benefits or requirements. Supplementary control by dynamic allocation permits changes in pollution control procedures as circumstances warrant. Uncertainties of inflation or recession, urban growth, energy shortages, health effects of various pollutants, and the flexibility and cost effectiveness of supplementary control make it a desirable strategy.

62783 **APTIC NO. 83022**

Hamburg, Fredric C.

FEASIBILITY OF A SINGLE STACK IN POWER PLANT CONSTRUCTION. *Preprint, TRW Environmental Services, Vienna, Va., 6p., 1975. 8 refs. (Presented at the Energy and the Environment, National Conference, 3rd, Oxford, Ohio, Sept. 29, Oct. 1, 1975.)*

Simulation modeling was performed on a hypothetical 1000 megawatt power plant and on three existing plants (representative of rural, urban, and suburban locations) to determine if a single stack for multiple boiler power plants is a technically and economically feasible method for meeting air quality standards. Sulfur dioxide concentrations with the single stack were about 71% lower for a 400-foot stack and 88% lower for an 800-foot stack than they were for the much more costly installation of three 400-foot stacks at the hypothetical 1000-megawatt plant. Similar results were obtained for the three existing power plants.

62784 **APTIC NO. 76483**

Mahajan, Kanti K.

TALL STACK DESIGN SIMPLIFIED. *Hydrocarbon Process., vol. 1975: 217-220, Sept. 1975. 7 refs.*

A simplified tall stack design is discussed, with emphasis on checking the dynamic stability of such structures. Calculation details for a free standing, 200-foot high, multiple diameter, unlined carbon steel stack are included. The calculation procedure consists of determining moments, allowable shell buckling stress, stack weight, stack plate thickness, anchor bolt chair, and calculating base and top plate thickness. The vibration analysis is determined by calculating the cantilever vibration and ovaling vibration.

62785 **APTIC NO. 83794**

Shatokhin, V. and V. Starostin

THE 320 M HIGH STACKS OF THE UGLEGORSK AREA POWER PLANT. *(Dymovye truby Uglegorskoy GRES vysotoy 320 m). Text in Russian. Prom. Stroit. Inzh. Sooruzh., no. 2:22-24, 1975.*

Detailed specifications of costs, and construction procedures are given for the double-shell chimney stacks no. 1 and 2 of the Uglegorsk regional electric power plant. The building of high stacks is a complicated engineering undertaking. The time is greatly reduced when the unloading of concrete is mechanized, and when a special lift for the reinforcement is installed.

1974

62786 **APTIC NO. 67138**

Belgea, Frank J.

DERIVATION, APPLICATION AND INTERRELATIONSHIP OF AMBIENT NOISE MEASUREMENT PARAMETERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 21p., 1974. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-65.)*

A study was undertaken to determine the rationale and justification for the profusion of schemes proposed from the purpose of quantifying nonimpulsive ambient noise levels. The study explored the multiplicity of noise measurement parameters involved in significant control strategies. Highlights of the study and derivations for typical parameters, weighted and unweighted and objective and subjective, are presented. The application of significant noise measurement techniques is explained in enough detail to impart understanding of complex methodology. Many of the noise control schemes are interrelated. Such techniques as time and frequency weighting are employed to derive new parameters from existing ones. Approximate conversion factors are presented for conversion between compatible systems. Uniform noise control legislation is necessary. To be most effective, noise control parameters should be expressed in terms to which the public can relate and which do not require an expensive black box to measure. (Author abstract modified)

62787 **APTIC NO. 83288**

Piot, Jacques Claude Michel

NON-POLLUTING CHIMNEY. *(Assignee not given.) U. S. Pat. 3,841,207. 7p., Oct. 15, 1974. 5 refs. (Appl. July 23, 1973, 2 claims).*

A chimney which discharges products of combustion at sufficient height, temperature, and velocity to avoid noticeably polluting the surrounding atmosphere is described. Conventional chimneys have a discharge flue which is surrounded by a sleeve of aluminum whose inner surface reflects back onto the flue the heat given off by the latter and thus achieves an efficient heat insulation. These chimneys are relatively weak and become oxidized both externally and internally. Their reflecting power diminishes, which reduces the heat insulation effect, increases the heat losses in the chimney, and produces an undesirable drop in the temperature of the products discharged. The flue of this chimney consists of a covering of heat insulating material surrounding the flue, and a casing of plastics material surrounding the covering.

62788 **APTIC NO. 73412**

Shinnanyo Municipal Office (Japan), Dept. of Environmental Pollution and Traffic

SUMMARY OF ENVIRONMENTAL POLLUTION. *(Kogai no gaikyo). Text in Japanese. 133p., Sept. 1974. 3 refs.*

A compendium of pollution data and pollution control measures for Shinnanyo City, Japan is contained in this book. Some of the material goes back to 1964. Topographical, meteorological, and industrial data, settling of pollution complaints, and pollution-related appropriations are listed. Atmospheric, water, noise and vibration pollutions are surveyed, and countermeasures are described. Gradual relocation and recompensation of residents (who desired to be moved) from the neighborhood of an industrial plant complex and construction of a greenbelt in the emptied areas around the complex have been in progress since 1959. Government financing is also available to medium and small-sized businesses for antipollution related expenses. City-financed medical treatment for disabilities caused by noxious gases and odors has been available since 1966. The extent of mercury poisoning in the population, especially among fishermen and their families, has been investigated by Yamaguchi Prefectural authorities and by Shinnanyo Municipal authorities since 1973. Physical examinations, including mercury analysis in hair, were conducted. Results were negative; no symptoms of mercury poisoning were found in this region.

1972

62789 **APTIC NO. 40260**

Schuphan, Werner

SCHIZOPHRENIA IN ENVIRONMENTAL PROTECTION? *(Schizophrenie im Umweltschutz). Text in German. Staetehygiene (Uelzen/Hamburg), 23(4):111, April 1972.*

World-wide discussion, practical suggestions, and partly legally required measures aim at the improvement of outside air, while the quality internal air in rooms has been of little concern. The presence of smokers with non-smokers at con-

ferences and meetings and in public places is tolerated despite increasing knowledge concerning the harmful effects of passive smoking. It seems justified to demand the same from internal polluters as is demanded of polluters of outside air.

1971

62790 APTIC NO. 43064

Proctor, Paul Dean and Thomas R. Beveridge

POPULATION, ENERGY, SELECTED MINERAL RAW MATERIALS, AND PERSONNEL DEMANDS, 2000 A.D. *Preprint, Society of Mining Engineers, AIME, N. Y., 19p., 1971. (Presented at the American Inst. of Mining, Metallurgical, and Petroleum Engineers Annual Meeting, New York, Feb. 26-March 4, 1971, Paper 71-H-107.)*

World population by the year 2000 may approximate 6.5 billion, the United States population 304 million. South Asian population increases between 1970 and 2000 will be triple the projected population of North America. Such anticipated increases in population cause concern for the standard of living in the world and the United States. Americans currently consume 32% of the energy supply of the world and similarly large percentages of the mineral raw materials. With only 6% of the present world population and slightly smaller percentage by 2000 much expanded world-wide production of energy and raw materials will be required to maintain even a standstill living standard. The projected consumption and expected uses of selected basic mineral raw materials and metals, including iron ore, copper, lead, zinc, sulfur, and phosphate and potash fertilizers, are described. Explorationists, mineral engineers, commodity economists, environmentalists, government mineral materials planners and coordinators, and metallurgists will be needed to avert expected energy-mineral raw materials shortages of the next millenium.

1970

62791 APTIC NO. 25198

Ross, F. F., A. J. Clarke, and D. H. Lucas

TALL STACKS - HOW EFFECTIVE ARE THEY? *Preprint, International Union of Air Pollution Prevention Associations, 50p., 1970. 23 refs. (Presented at the International Clean Air Congress, 2nd, Washington, D. C., Dec. 6-11, 1970, Paper ME-14A.)*

While the benefits of tall chimneys are taken for granted in industrial circles, the tall chimney has received a number of criticisms in the political field of Clean Air. These criticisms are identified, and in most cases countered. If total pollution is defined as the total emission of pollutant, total pollution in this sense reduces very rapidly as the chimney height increases because virtually all of the effects on mankind occur within 10 or 20 m of the ground. Tall chimneys reduce pollution concentrations at all distances, and the reduction is most marked close to the source where indeed the reduction is most needed. In certain weather conditions and topographical situations, the benefit from a tall stack may be less than in an open plain in average weather conditions but is still valuable. It is most unlikely that tall stacks cause greater increases in the acidity of rainfall at greater distances than at lesser distances. Tall stacks are relatively expensive when used with high sulfur fuels. They may be limited by the requirements of air navigation, and their worst feature is that they are obvious to the eye. The thermal rise of the plume is a valuable and effective addition to the height of a chimney. In considering the time duration for which various concentrations of sulfur dioxide are experienced, hourly averages which will not damage plants are probably the most critical criteria in pollution control. At lower concentrations, SO2 will not only be harmless but will be beneficial to plants. Methods for the removal, or reduction, of pollution at the source are usually very expensive additions to high chimneys, but are in no sense complete alternatives. (Author abstract modified)

1966

62792 APTIC NO. 42551

Boggs, J. Caleb

A CONGRESSIONAL VIEW OF THE PROBLEM. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 218-220. (Dec. 12-14.)*

The control of air pollution is an added industrial expense but air pollution, uncontrolled, costs $11 billion/yr. An estimated two-thirds reduction in the level of pollution could be realized with the expenditure of $3 billion/yr. The techniques are available to do the job, and the two figures indicate that an effective air pollution program would pay for itself. Healthier and more pleasant living conditions would be a bonus. The Federal Government should fund research, devise and suggest reasonable standards, and provide control and enforcement in interstate problems. Local and state action, if Federally supported, could lead to success.

62793 APTIC NO. 42524

Muskie, Edmund S.

SETTING GOALS FOR CLEAN AIR. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 596-600. (Dec. 12-14.)*

Air pollution control policies and goals set for clean air are reviewed. Air pollution control costs money, jobs, and disruption of certain industries; air pollution costs money, jobs, and disruption of industry and lives. The best ways to pay the cost of control and to organize efforts must be decided depending on the definition of goals. The American people are less concerned with the source of dirty air than with the supply of clean air. The ultimate goal, to be achieved through national ambient air standards, should be to approach a level at which man will have to cope with little more than the natural background level of pollution.

62794 APTIC NO. 42548

Porter, Elliot F., Jr.

CONCLUDING REMARKS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 268-269. (Dec. 12-14.)*

Studies indicate that industry is nearing adulthood in its approach to the air pollution problem. Industrialists now appreciate the continuity of the problems and place considerable emphasis on change of process and maintenance. The industrial spokesmen who appear at and participate in air pollution colloquia are, nevertheless, likely to be the cream of the crop. They have a responsibility to educate their fellows. There are still the ghosts of the once cherished notion that industry has a prior claim on the use of the air. Industry will be aware of success in air pollution control when economic and political aspects are no longer prime considerations, leaving only the technical matters to be dealt with.

62795 APTIC NO. 42519

Schorr, Daniel

A VIEW FROM THE OUTSIDE. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C., 1966, p. 637-640. (Dec. 12-14.)*

Every great problem that cannot be dealt with adequately by existing institutions increases the pressure for new ones, or the shifting of power to some other ones. If it turns out that factories, cities, and states, acting alone or in concert, cannot manage their air, then the heat will be on for some system that can. European communities, centuries old, have learned that their resources, forest, land, water, and air, are not limitless and that society must husband what it has. The United States is fast approaching the same situation, but there is still a certain tendency to extend limitless frontier psychology into the sky. The idea of the atmosphere as a relatively closed envelope of life- giving gases is penetrating only rather slowly. Some problems connected with emissions and abatement within the fields of motor vehicles, heat and power generation, industrial operation, and solid waste disposals and the roles of state, local, regional, and federal governments are reviewed.

62796 **APTIC NO. 42542**

Stewart, William H.

CONCLUDING ADDRESS. *Public Health Service, Washington, D. C., Proc. Natl. Conf. Air Pollution, 3rd, Washington, D. C. 1966, p. 641-643. (Dec. 12-14.)*

Doubt has been removed concerning the health hazards of air pollution. People are very angry about the condition of the air they are breathing. There is no longer a belief in the choice between progress and clean air. General public indignation now needs to be directed towards specific accomplishment. Today not only the mandate to carry out all intentions for air quality improvement but also a number of practical tools for doing the job are available.

1950

62797 **APTIC NO. 43120**

Hill, George R. and Moyer D. Thomas

DILUTION AND ITS PART IN EFFECTIVE AIR POLLUTION CONTROL. *Ind. Med. Surg., 19(3):121-125, March 1950. 16 refs.*

Adequate dilution from the standpoint of control of atmospheric pollution means the mixing of non-normal or foreign components of the air -- whether they be dusts, fumes, mists, or gases with sufficient air to render their presence unobjectionable. As illustrative of how an acute sulfur dioxide problem was completely solved by means of dilution of the smoke stream from a very tall stack, the case of the smelter at Selby, California, is cited. The equations of Bosanquet and Pearson, and of Sutton, express the ground level concentration of the gases downwind, from a single chimney and from a row of chimneys. The degree of agreement between actual data and these theoretical curves is mentioned, as well as the degree of dilution which sulfur dioxide in American industrial cities actually attains.

SUBJECT INDEX

A

ABATEMENT
61596, 62238, 62246, 62249, 62260, 62263, 62264, 62265, 62272, 62274, 62285, 62286, 62330, 62331, 62333, 62334, 62347, 62372, 62483, 62542, 62543, 62643, 62670, 62689, 62691, 62703, 62713, 62714, 62717, 62720, 62722, 62723, 62731, 62732, 62734, 62735, 62736, 62737, 62738, 62739, 62740, 62741, 62742, 62743, 62744, 62745, 62746, 62747, 62748, 62750, 62751, 62752, 62753, 62754, 62757, 62768, 62769, 62771, 62772, 62773, 62774, 62776, 62777, 62778, 62789, 62792, 62793, 62794, 62795, 62796

ABSCISSION
61986

ABSORPTION (CONTROL)
61793, 61841, 62181, 62200

ABSORPTION PHENOMENA
61459, 61611, 61787, 62024, 62105, 62172, 62193

ACETALDEHYDE
61513

ACETIC ACID
61876, 62157, 62179

ACETONE
61447, 61755, 61900

ACETYLENES
61447, 62665

ACID SMUTS
61979

ACROLEIN
61371, 61410, 61490, 61513, 61523, 61550, 61697, 61718, 61750, 61885, 62035, 62326

ACTIVATED CARBON
62537

ACUTE
61489, 61508, 61530, 61534, 61549, 61555, 61575, 61613, 61694, 61732, 61748, 61772, 61776, 61803, 61810, 61814, 61823, 61828, 61832, 61835, 61858, 61870, 61875, 61887, 61890, 61900, 61901, 61913, 61914, 62092, 62140, 62202, 62396

ADAPTATION
61778, 61847, 62146

ADOLESCENCE
61389, 61406, 61446, 61472, 61520, 61525, 61542, 61557, 61561, 61574, 61576, 61592, 61645, 61655, 61656, 61666, 61679, 61796

ADSORPTION PHENOMENA
62211

ADVISORY SERVICES
62479, 62642, 62715, 62722, 62752, 62763

AEROALLERGENS
61533, 61637, 62070

AERODYNAMICS
61907

AEROSOL APPLICATIONS
62390

AEROSOL APPLICATIONS (NEC)
62390

AEROSOLS
61369, 61370, 61460, 61466, 61478, 61495, 61595, 61659, 61695, 61706, 61707, 61730, 61734, 61790, 61810, 61812, 61818, 61824, 61833, 61872, 61898, 61953, 61989, 61991, 62105, 62282, 62298, 62368, 62390, 62656

AFRICA
61871

AGRICULTURAL CHEMICAL PLANTS
61419, 61590, 62061, 62062, 62143, 62168, 62282, 62354, 62377, 62487, 62555

AGRICULTURAL SERVICES
61792, 62205, 62375

AGRICULTURE INDUSTRY
61563, 61792, 62205, 62375, 62704

AIR CONDITIONING EQUIPMENT
61870, 61878

AIR POLLUTION EPISODES
61447, 61488, 61796, 61815, 61825, 61845, 61859, 61981, 62071, 62081, 62097, 62341, 62471, 62476, 62477, 62501, 62517, 62518, 62541, 62608, 62670, 62694, 62712, 62725, 62726, 62757

AIR POLLUTION FORECASTING
62335, 62351, 62414, 62436, 62451, 62510, 62658

AIR POLLUTION INDICES
62427, 62436, 62540, 62689

AIR QUALITY CRITERIA
62240, 62316, 62319, 62325, 62326, 62327, 62328, 62330, 62332, 62416, 62526, 62540, 62578, 62636, 62639, 62640, 62721, 62728, 62732, 62733, 62750, 62762

AIR QUALITY MAINTENANCE AREAS
62347, 62386, 62507, 62522, 62597, 62655

AIR QUALITY MEASUREMENT PROGRAMS
61446, 61526, 61539, 61624, 61754, 61814, 61865, 61868, 61871, 61892, 61991, 62044, 62071, 62074, 62121, 62159, 62196, 62274, 62276, 62295, 62346, 62396, 62401, 62405, 62410, 62411, 62421, 62424, 62431, 62436, 62451, 62452, 62471, 62477, 62515, 62517, 62518, 62525, 62543, 62563, 62565, 62568, 62569, 62580, 62581, 62583, 62597, 62598, 62599, 62600, 62601, 62602, 62603, 62604, 62609, 62629, 62637, 62638, 62652, 62656, 62662, 62665, 62677, 62678, 62679, 62680, 62681, 62682, 62683, 62684, 62690, 62694, 62703, 62708, 62712, 62719, 62720, 62722, 62733, 62759

AIR QUALITY STANDARDS
61354, 61509, 61549, 61600, 61630, 61640, 61649, 61678, 61682, 61704, 61794, 61809, 61823, 61858, 61866, 61875, 61876, 61893, 61900, 61915, 62097, 62235, 62271, 62292, 62294, 62297, 62302, 62303, 62305, 62308, 62309, 62311, 62312, 62316, 62317, 62318, 62319, 62320, 62325, 62326, 62327, 62328, 62329, 62330, 62331, 62332, 62334, 62337, 62353, 62366, 62376, 62385, 62416, 62419, 62428, 62451, 62459, 62462, 62470, 62474, 62484, 62485, 62486, 62496, 62503, 62512, 62525, 62526, 62528, 62542, 62552, 62559, 62579, 62584, 62586, 62591, 62607, 62608, 62610, 62611, 62638, 62646, 62649, 62650, 62661, 62673, 62674, 62686, 62687, 62692, 62696, 62717, 62721, 62723, 62726, 62728, 62730, 62793

AIR QUALITY SURVEYS
61446, 62396, 62424, 62580, 62638, 62690

AIR RESOURCE MANAGEMENT
62253, 62331, 62335, 62347, 62364, 62373, 62374, 62383, 62414, 62416, 62458, 62481, 62513, 62527, 62576, 62586, 62590, 62643, 62646, 62658, 62661, 62664, 62667, 62710, 62728, 62761, 62771, 62774, 62793, 62795

AIR-FUEL RATIO
61560

AIRCRAFT
62320, 62393, 62413, 62482, 62640

AIRPORTS
62376, 62413, 62484, 62567

ALABAMA
62508

ALASKA
62656

ALCOHOLS
61447, 61482, 61549, 61627, 61636, 61730, 61755, 61760, 61900, 62166, 62209, 62226, 62398

ALDEHYDES
61371, 61410, 61447, 61490, 61513, 61522, 61523, 61550, 61575, 61627, 61697, 61718, 61750, 61760, 61775, 61844, 61885, 62035, 62209, 62226, 62326, 62339

ALERTS
61981, 62071, 62081, 62097, 62471, 62476, 62477, 62501, 62517, 62518, 62541, 62608, 62712, 62725, 62726, 62757

ALFALFA
61928, 62015, 62093

ALGAE
62051, 62136

ALKALIES AND CHLORINE PLANTS
62054

ALKALINE ADDITIVES
62266, 62634

ALLERGIES
61385, 61387, 61420, 61422, 61438, 61475, 61530, 61533, 61542, 61544, 61563, 61570, 61573, 61576, 61592, 61637, 61699, 61770, 61789, 61834, 61897, 61905, 62070

ALUMINUM
61877, 62204, 62208, 62226, 62756

ALUMINUM COMPOUNDS
61386, 61582, 61620, 61921, 62561

ALUMINUM OXIDES
61499

ALUMINUM PRIMARY PRODUCTION
61419, 61452, 61499, 62099, 62133, 62240, 62289, 62293, 62625

ALUMINUM SECONDARY SMELTING AND REFINING
61419, 61499, 62006, 62040, 62041, 62062, 62067, 62068, 62099, 62133, 62240, 62561

ALVEOLI
61379, 61386, 61396, 61433, 61447, 61460, 61465, 61470, 61498, 61519, 61548, 61588, 61597, 61617, 61641, 61677, 61686, 61687, 61688, 61689, 61698, 61710, 61720, 61740, 61741, 61788, 61818, 61823, 61848, 61874

AMINES
61577, 61627, 61736, 62209, 62221, 62627

AMINO ACIDS
61400, 61418, 61453, 61685, 61689, 61793, 61878, 61896, 62089

AMMONIA
61351, 61447, 61730, 61755, 61775, 61837, 61844, 61863, 61872, 61990, 62190, 62200, 62220, 62281, 62453, 62627

AMMONIUM COMPOUNDS
61351, 61447, 61459, 61706, 61730, 61755, 61775, 61837, 61844, 61863, 61872, 61990, 62055, 62110, 62190, 62200, 62220, 62281, 62453, 62627

AMMONIUM SULFATE
62110

ANEMIA
61714, 61806, 62067

ANIMALS (NON-HUMAN)
61352, 61355, 61357, 61359, 61360, 61362, 61364, 61366, 61368, 61370, 61371, 61372, 61373, 61374, 61377, 61378, 61379, 61380, 61381, 61383, 61385, 61388, 61410, 61413, 61417, 61423, 61424, 61425, 61428, 61429, 61432, 61433, 61434, 61438, 61441, 61450, 61454, 61457, 61459, 61460, 61462, 61463, 61465, 61469, 61470, 61471, 61477, 61478, 61480, 61484, 61485, 61489, 61494, 61496, 61497, 61507, 61510, 61511, 61512, 61513, 61517, 61518, 61519, 61529, 61531, 61535, 61537, 61540, 61541, 61548, 61549, 61551, 61554, 61555, 61556, 61558, 61559, 61577, 61588, 61593, 61598, 61601, 61602, 61606, 61612, 61616, 61620, 61628, 61630, 61632, 61633, 61639, 61647, 61648, 61650, 61651, 61652, 61654, 61668, 61672, 61675, 61677, 61680, 61684, 61686, 61687, 61688, 61689, 61692, 61701, 61702, 61703, 61706, 61707, 61709, 61710, 61713, 61715, 61718, 61720, 61730, 61731, 61734, 61741, 61744, 61746, 61748, 61750, 61755, 61757, 61759, 61760, 61761, 61762, 61773, 61775, 61781, 61782, 61784, 61785, 61790, 61799, 61800, 61803, 61807, 61809, 61810, 61811, 61816, 61819, 61820, 61823, 61826, 61835, 61837, 61838, 61839, 61843, 61844, 61847, 61849, 61852, 61855, 61857, 61863, 61864, 61865, 61866, 61871, 61874, 61875, 61878, 61879, 61882, 61885, 61886, 61887, 61891, 61901, 61908, 61910, 61913, 61915, 61923, 61924, 61954, 61990, 62017, 62018, 62022, 62027, 62031, 62067, 62082, 62095, 62102, 62119, 62124, 62135, 62141, 62145, 62154, 62156, 62163, 62185, 62186, 62187, 62188, 62189, 62194, 62196, 62197, 62202, 62204, 62219, 62302, 62349, 62779

ANOXIA
61469, 61644, 61843

ANTHRACENES
61856

ANTIBODIES
61471, 61497, 61632, 61703

ANTIDOTES
61462, 61747, 61864

ANTIGENS
61386, 61486, 61533, 61673, 61742

ANTIMONY COMPOUNDS
62060, 62082

APPLES
62056

APRICOTS
62093

AQUATIC ANIMALS
61865, 62031

AREA EMISSION ALLOCATIONS
62297, 62364, 62414, 62520, 62576

AREA SOURCES
62618

AREA SURVEYS
61446, 61526, 61539, 61624, 61754, 61814, 61865, 61868, 61871, 61892, 61991, 62044, 62071, 62074, 62121, 62159, 62196, 62274, 62396, 62405, 62424, 62569, 62580, 62597, 62598, 62599, 62600, 62601, 62602, 62603, 62604, 62609, 62638, 62677, 62678, 62679, 62680, 62681, 62682, 62683, 62684, 62690, 62703, 62708, 62712, 62722, 62759

ARIZONA
62121, 62375, 62378, 62415, 62549

AROMATIC HYDROCARBONS
61434, 61447, 61568, 61606, 61774, 61775, 61811, 61841, 61844, 62209, 62327

ARSENIC COMPOUNDS
61452, 61482, 61518, 61571, 61636, 61730, 61736, 61738, 61760, 61774, 61905, 61984, 62114, 62200

ASBESTOS
61386, 61404, 61417, 61482, 61524, 61594, 61595, 61627, 61636, 61643, 61736, 61746, 61811, 61818, 61840, 61881, 61896, 61905, 61907, 61919, 62377, 62379, 62380, 62402, 62449, 62722

ASBESTOSIS
61451, 61474, 61818, 61881

ASH TREES
62024

ASHES
61924

ASPHALT CONCRETE PLANTS (NON-REFINERIES)
61801, 62377, 62379, 62546

ASPHALT PAVING
62553, 62556, 62685

ASTHMA
61350, 61374, 61375, 61384, 61394, 61395, 61401, 61412, 61419, 61420, 61436, 61437, 61438, 61439, 61442, 61445, 61493, 61505, 61512, 61514, 61515, 61516, 61530, 61533, 61535, 61543, 61544, 61565, 61566, 61570, 61573, 61576, 61578, 61584, 61585, 61587, 61589, 61592, 61607, 61615, 61623, 61626, 61637, 61656, 61667, 61679, 61699, 61700, 61703, 61712, 61716, 61721, 61722, 61727, 61732, 61733, 61817, 61916, 61975, 62075, 62422, 62686

ATLANTA
62576

ATMOSPHERIC MOVEMENTS
61719, 62062, 62178, 62223, 62280, 62341, 62583, 62612, 62712, 62720, 62728

ATTACK RATES
61624, 61770

AUSTRALASIA
61569, 61614, 61769, 61775, 61781, 61844, 61858, 61991, 62046, 62249, 62340, 62374, 62472, 62728, 62761, 62763

AUSTRALIA
61569, 61769, 61775, 61781, 61844, 61858, 62046, 62249, 62340, 62472, 62728, 62761

AUSTRIA
62054, 62343, 62648

AUTOMATIC (MODIFIER)
62694

AUTOMATIC MEASUREMENT METHODS
61906, 62401, 62405, 62431, 62665, 62694, 62712

AUTOMOBILES
61368, 61466, 61558, 61653, 61677, 61705, 61716, 62022, 62086, 62114, 62177, 62230, 62299, 62306, 62307, 62316, 62320, 62323, 62331, 62341, 62371, 62389, 62408, 62412, 62427, 62430, 62454, 62542, 62605, 62610, 62634, 62640, 62644, 62649, 62659, 62687, 62716, 62717, 62718, 62722, 62728, 62735, 62745, 62746, 62749, 62767, 62795

AUTOMOTIVE EMISSION CONTROL
61559, 61560, 61705, 61706, 61707, 61708, 62230, 62299, 62307, 62331, 62388, 62402, 62415, 62432, 62605, 62610, 62634, 62640, 62647, 62659, 62687, 62692, 62716, 62717, 62723, 62731, 62746, 62749, 62757

AUTOPSY
61496, 61765, 61881, 61902

AVAILABILITY
62575

B

BACTERIA
61478, 61527, 61684, 61705, 61756, 61870, 61874, 61964, 62115, 62135, 62206, 62216, 62657

BAG FILTERS
62279, 62315, 62729

BARIUM COMPOUNDS
61630, 62060

BARLEY
61951, 61957

BASELINE DETERMINATION
62581, 62694

BEANS
61928, 61940, 61986, 61989, 61997, 62016, 62045, 62103, 62140

BEECH TREES
62084

BEETS (GARDEN)
61928

BELGIUM
61767, 62136, 62713

BENZENE-SOLUBLE ORGANIC MATTER
61684

BENZENES
61434, 61447, 61775, 61841, 61844

BENZO(3-4)PYRENE
61378, 61381, 61383, 61417, 61455, 61465, 61487, 61496, 61529, 61552, 61612, 61616, 61684, 61760, 61860, 61861, 61883, 61920, 61986, 62336

BENZOPYRENES
61378, 61381, 61383, 61417, 61455, 61465, 61487, 61496, 61518, 61529, 61552, 61612, 61616, 61684, 61709, 61736, 61760, 61860, 61861, 61883, 61920, 61986, 62302, 62336, 62354, 62396

BERYLLIUM COMPOUNDS
61386, 61390, 61463, 61540, 61554, 61736, 61771, 61875, 62296, 62377, 62379, 62380, 62402

BESSEMER CONVERTERS
62279, 62729

BEVERAGE INDUSTRY
61493

BIO-ASSAY
61467, 61552, 61684, 61855

BIOCHEMISTRY
61365, 61368, 61382, 61400, 61418, 61428, 61429, 61434, 61453, 61462, 61480, 61481, 61482, 61489, 61513, 61549, 61645, 61650, 61672, 61678, 61685, 61687, 61688, 61689, 61706, 61710, 61714, 61720, 61730, 61756, 61774, 61790, 61793, 61798, 61800, 61805, 61816, 61823, 61878, 61896, 61904, 61926, 62072, 62085, 62089, 62126, 62135, 62151, 62173, 62179, 62198

BIOCLIMATOLOGY
61439, 61754, 61845, 61905, 61916, 62147, 62312

BIOLOGICAL FACTORS
61365, 61368, 61382, 61400, 61418, 61428, 61429, 61434, 61453, 61462, 61480, 61481, 61482, 61489, 61513, 61549, 61645, 61650, 61672, 61678, 61685, 61687, 61688, 61689, 61706, 61710, 61714, 61720, 61730, 61756, 61774, 61790, 61793, 61798, 61800, 61805, 61816, 61823, 61878, 61896, 61904, 61926, 62072, 62085, 62089, 62126, 62135, 62151, 62173, 62179 62198

BIRCH TREES
62023, 62024, 62056, 62148

BIRDS
61359, 61380, 61651, 61652, 61871, 62022, 62031, 62219

BLAST FURNACE AND BASIC STEEL PRODUCTS M
61565, 61566, 61658, 62260, 62279, 62408, 62500, 62532, 62558, 62624, 62729

BLAST FURNACES
62279

BLINDNESS
61891

BLOOD CELLS
61388, 61408, 61418, 61429, 61431, 61446, 61458, 61472, 61475, 61509, 61551, 61594, 61598, 61601, 61606, 61630, 61639, 61650, 61710, 61711, 61713, 61714, 61715, 61755, 61756, 61784, 61793, 61803, 61831, 61839, 61855, 61864, 61877, 61878, 61893, 61921, 62067, 62202

BLOOD CHEMISTRY
61377, 61400, 61418, 61444, 61446, 61485, 61582, 61602, 61650, 61677, 61711, 61730, 61755, 61756, 61784, 61793, 61798, 61803, 61837, 61843, 61853, 61863, 61878, 61891, 61904, 61910, 61921, 61922, 62196

BLOOD GAS ANALYSIS
61610

BLOOD PRESSURE
61356, 61604, 61622, 61647, 61649, 61721, 61805, 61866

BLOOD SERUM
61361, 61405, 61449, 61462, 61463, 61473, 61513, 61569, 61588, 61590, 61639, 61650, 61654, 61672, 61675, 61714, 61767, 61779, 61829, 61836, 61838, 61839, 62067

BLOOD VESSELS
61782, 61807, 61852, 62325

BODIES OF WATER
62087, 62174, 62210, 62219, 62223, 62228, 62573, 62579, 62694, 62728

BODY FLUIDS
61356, 61361, 61374, 61405, 61419, 61449, 61462, 61463, 61473, 61481, 61513, 61514, 61569, 61580, 61582, 61588, 61589, 61590, 61591, 61597, 61599, 61607, 61639, 61649, 61650, 61654, 61662, 61670, 61672, 61675, 61714, 61717, 61721, 61729, 61764, 61767, 61779, 61795, 61829, 61832, 61836, 61838, 61839, 61847, 61868, 61921, 62067

BOILERS
61585, 62337, 62555, 62564, 62598, 62599, 62600, 62601, 62602, 62603, 62604, 62677, 62678, 62679, 62680, 62681, 62682, 62683, 62684

BONES
61414, 61419, 61427, 61450, 61475, 61512, 61518, 61540, 61556, 61588, 61629, 61645, 61654, 61655, 61663, 61698, 61789, 61816, 61820, 61871, 61877, 62022, 62204

BORON COMPOUNDS
62052

BRAIN
61377, 61469, 61537, 61548, 61558, 61696, 61831, 61838

BRASS AND BRONZE SECONDARY SMELTING AND
62377

BREATHING
61355, 61371, 61432, 61455, 61460, 61466, 61476, 61478, 61484, 61489, 61508, 61530, 61554, 61555, 61577, 61588, 61595, 61609, 61616, 61621, 61658, 61691, 61695, 61697, 61706, 61734, 61740, 61741, 61759, 61787, 61797, 61810, 61811, 61812, 61818, 61819, 61824, 61826, 61832, 61833, 61837, 61840, 61844, 61860, 61861, 61870, 61872, 61883, 61907, 61924, 62062, 62114

BREATHING APPARATUS
61456

BROMIDES
61855

BROMINE
61466, 61953

BROMINE COMPOUNDS
61855, 62097

BRONCHI
61359, 61378, 61396, 61470, 61548, 61584, 61593, 61598, 61617, 61641, 61651, 61654, 61671, 61695, 61701, 61744, 61757, 61818, 61832, 61847, 61848, 61898

BRONCHIAL CANCER
61786, 61883, 61898

BRONCHITIS
61375, 61387, 61399, 61401, 61402, 61419, 61435, 61436, 61437, 61445, 61475, 61488, 61493, 61498, 61506, 61514, 61515, 61516, 61525, 61543, 61546, 61547, 61557, 61570, 61579, 61581, 61582, 61585, 61591, 61592, 61605, 61607, 61615, 61623, 61626, 61649, 61655, 61662, 61669, 61676, 61679, 61700, 61701, 61712, 61716, 61722, 61729, 61744, 61777, 61780, 61789, 61795, 61804, 61806, 61811, 61815, 61817, 61821, 61835, 61877, 61884, 61895, 61897, 61914, 61916, 62083, 62455, 62686

BRONCHOCONSTRICTION
61494, 61615, 61884

BRONCHOPNEUMONIA
61475

BUCKWHEAT
61928, 61967, 62004, 62093, 62122, 62130

BUDGETING
62606, 62713, 62714, 62731, 62734, 62736, 62737, 62744, 62752, 62753, 62754, 62792

BUILDING CONSTRUCTION
62449, 62685

BUILDINGS
61830, 61878, 62212, 62218, 62222, 62229, 62282, 62318, 62657

BULGARIA
61522, 62226

BURNING
61358, 62280, 62375, 62395, 62555, 62573, 62757

BUTANES
61866, 62665

BY-PRODUCT RECOVERY
62205, 62234, 62247, 62345, 62570, 62737

BYSSINOSIS
61742, 61884

C

CABBAGE
61997, 61998, 62004, 62029, 62062, 62103, 62110

CADMIUM
62226

CADMIUM COMPOUNDS
61369, 61376, 61377, 61380, 61405, 61462, 61479, 61485, 61619, 61652, 61653, 61681, 61685, 61686, 61687, 61688, 61738, 61760, 61767, 61777, 61798, 61805, 61947, 61954, 61962, 61999, 62001, 62020, 62044, 62047, 62048, 62053, 62060, 62076, 62078, 62080, 62097, 62108, 62123, 62156, 62197, 62525

CALCIUM COMPOUNDS
61380, 61466, 61553, 61611, 61659, 61855, 61953, 62052, 62085, 62201

CALCIUM SULFATES
61855

CALIBRATION METHODS
61456, 62287, 62295, 62365, 62515, 62568, 62652, 62656, 62694

CALIFORNIA
61707, 61915, 62196, 62206, 62207, 62274, 62300, 62323, 62324, 62377, 62379, 62380, 62394, 62441, 62442, 62444, 62512, 62529, 62566, 62577, 62650, 62666, 62723, 62734, 62745, 62755, 62757, 62759, 62779

CANADA
61682, 61695, 61780, 61885, 61888, 61985, 62167, 62190, 62211, 62240, 62243, 62354, 62480, 62578, 62630, 62710, 62713, 62716, 62720

CANCER
61375, 61378, 61403, 61409, 61411, 61417, 61448, 61451, 61452, 61457, 61474, 61475, 61482, 61487, 61518, 61529, 61531, 61538, 61540, 61554, 61567, 61577, 61586, 61595, 61636, 61642, 61643, 61651, 61653, 61684, 61706, 61709, 61712, 61735, 61737, 61739, 61740, 61746, 61786, 61789, 61801, 61804, 61807, 61818, 61825, 61827, 61867, 61873, 61881, 61883, 61898, 61905, 61909, 61916, 61919, 62302

CANTALOUPES
61986

CAPITAL
62235, 62238, 62240, 62254, 62256, 62283

CARBOHYDRATES
61650, 61790

CARBON
61417, 61616, 61736, 61756, 62174, 62430, 62537

CARBON BLACK
61616, 62174

CARBON DIOXIDE
61447, 61647, 61736, 61774, 61777, 61784, 61855, 61900, 61970, 62005, 62174, 62205, 62213, 62229, 62231, 62291, 62322, 62421, 62494, 62656, 62657

CARBON DISULFIDE
61447, 61450, 61900, 62305, 62325, 62665

CARBON MONOXIDE
61353, 61357, 61362, 61365, 61389, 61390, 61393, 61447, 61469, 61483, 61491, 61492, 61501, 61502, 61536, 61539, 61545, 61562, 61572, 61610, 61613, 61622, 61628, 61634, 61639, 61644, 61647, 61690, 61744, 61747, 61760, 61774, 61777, 61779, 61781, 61782, 61784, 61785, 61799, 61807, 61809, 61826, 61828, 61831, 61835, 61836, 61842, 61843, 61846, 61852, 61855, 61857, 61858, 61874, 61882, 61894, 61895, 61903, 61908, 61911, 61915, 61920, 62199, 62218, 62271, 62307, 62312, 62316, 62320, 62331, 62339, 62354, 62366, 62388, 62401, 62412, 62415, 62430, 62431, 62451, 62454, 62462, 62472, 62482, 62484, 62494, 62497, 62513, 62518, 62520, 62537, 62562, 62565, 62568, 62577, 62584, 62610, 62611, 62620, 62623, 62628, 62634, 62638, 62649, 62653, 62656, 62657, 62692, 62712, 62715, 62716, 62717, 62718, 62722, 62723, 62725, 62726, 62759

CARBON TETRACHLORIDE
62255, 62656

CARBONATES
62175, 62201

CARBONATION
61483

CARBONYLS
61447, 61900

CARBOXYHEMOGLOBIN
61365, 61545, 61610, 61613, 61690, 61747, 61779, 61782, 61807, 61826, 61828, 61830, 61831, 61842, 61843, 61846, 61852, 61855, 61857, 61858, 61903, 61908, 61911, 61920

CARBURETION
62634

CARCINOGENS
61378, 61381, 61403, 61417, 61451, 61457, 61474, 61482, 61483, 61487, 61518, 61529, 61577, 61595, 61616, 61627, 61675, 61684, 61706, 61709, 61716, 61736, 61760, 61794, 61800, 61811, 61856, 61867, 61869, 61883, 61964, 61986, 62302

CARDIOVASCULAR DISEASES
61531, 61613, 61634, 61644, 61771, 61775, 61785, 61790, 61807, 61815, 61826, 61852, 61903, 61912, 61918, 61922, 62396

CARROTS
62141

CATALYSIS
61558, 61559, 62610, 62634

CATALYSTS
61558, 61559

CATALYTIC AFTERBURNERS
61362, 61368, 61705, 61706, 61707, 61708, 62605, 62610, 62634

CATALYTIC OXIDATION
61558, 61559

CATS
61355

CATTLE
61668, 62156, 62196, 62202, 62204, 62779

CELL GROWTH
61360, 61475, 61477, 61480, 61519, 61559, 61731, 61741, 61799, 61855, 61896, 62179, 62181

CELL METABOLISM
61368, 61447, 61552, 61645, 61684, 61685, 61686, 61689, 61755, 61760, 61799, 61800, 61847, 62126, 62179, 62180, 62199

CELL WALLS
61774

CELLS (BIOLOGY)
61377, 61379, 61388, 61398, 61408, 61418, 61423, 61424, 61425, 61428, 61429, 61431, 61446, 61458, 61465, 61472, 61475, 61480, 61509, 61511, 61513, 61519, 61523, 61540, 61551, 61553, 61579, 61584, 61594, 61597, 61598, 61601, 61606, 61617, 61630, 61639, 61650, 61677, 61685, 61686, 61687, 61688, 61689, 61701, 61706, 61710, 61711, 61713, 61714, 61715, 61720, 61740, 61741, 61755, 61756, 61757, 61759, 61760, 61784, 61788, 61793, 61799, 61800, 61803, 61811, 61823, 61831, 61832, 61839, 61847, 61848, 61855, 61864, 61867, 61869, 61874, 61877, 61878, 61893, 61896, 61915, 61921, 62028, 62067, 62117, 62126, 62151, 62179, 62180, 62202

CEMENT PLANTS (HYDRAULIC)
61493, 62050, 62175, 62377, 62379, 62435

CEMENTS
61771, 62222, 62282, 62322

CENTRAL AMERICA
62623

CERIUM COMPOUNDS
62148

CESIUM COMPOUNDS
61888, 62060, 62148

CHEMICAL BONDS
61774

CHEMICAL COMPOSITION
61550, 61684, 61707, 61979, 62020, 62092, 62177, 62340

CHEMICAL METHODS
62205, 62665

CHEMICAL PROCESSES
62198, 62278, 62281, 62322, 62728, 62756, 62770

CHEMICALS AND ALLIED MANUFACTURING
61419, 61450, 61514, 61566, 61567, 61590, 61607, 61655, 61917, 62017, 62054, 62061, 62062, 62075, 62143, 62168, 62256, 62282, 62354, 62377, 62434, 62487, 62498, 62505, 62508, 62530, 62555, 62560, 62584, 62612, 62704

CHEMISTS
62763

CHIBA PREFECTURE
61666, 62017, 62073, 62583

CHICAGO
61353, 61815, 62373, 62703, 62725

CHINA
62418

CHLORIDES
61459, 61774, 61900, 62014, 62165, 62183, 62223

CHLORINATED HYDROCARBONS
61476, 61507, 61528, 61531, 61567, 61595, 61675, 61741, 61761, 61774, 61777, 61841, 61900, 61912, 61917, 61918, 62179, 62209, 62211, 62255, 62310, 62398, 62429, 62471, 62613, 62629, 62656

CHLORINE
61466, 61528, 61821, 61953, 62026, 62146, 62166, 62183, 62190, 62525, 62561, 62665

CHLORINE COMPOUNDS
61390, 61459, 61774, 61900, 61935, 61978, 62014, 62097, 62158, 62165, 62183, 62185, 62223

CHLOROFORM
62255, 62429

CHLOROPLASTS
62126, 62140, 62149, 62165, 62180, 62199

CHLOROSIS
61957, 61961, 61972, 61980, 62108, 62125, 62146, 62159, 62207

CHROMATOGRAPHY
61503, 61779, 61869, 61917, 61926, 62304, 62653, 62665

CHROMIUM COMPOUNDS
61380, 61381, 61406, 61417, 61482, 61586, 61636, 61652, 61653, 61685, 61686, 61736, 61774, 61777, 61816, 61905, 62060, 62161

CHROMIUM OXIDES
61582

CHRYSANTHEMUM
62012, 62099

CILIA
61398, 61423, 61424, 61425, 61523, 61579, 61584, 61617, 61701, 61740, 61757, 61759, 61811, 61832, 61848

CIRCULATORY SYSTEM
61352, 61371, 61396, 61460, 61476, 61537, 61545, 61548, 61580, 61584, 61604, 61609, 61613, 61622, 61628, 61654, 61661, 61683, 61697, 61716, 61718, 61732, 61733, 61750, 61775, 61782, 61785, 61799, 61804, 61807, 61815, 61826, 61844, 61850, 61852, 61882, 61885, 61900, 62325

CITIZENS GROUPS
61585, 62422, 62455, 62476, 62693, 62698, 62702, 62763, 62775

CITRUS
62086, 62087, 62088

CITY GOVERNMENTS
62373, 62388, 62640, 62712, 62725, 62742

CLEAN AIR ACT
62323, 62324, 62347, 62391, 62392, 62432, 62438, 62465, 62466, 62468, 62501, 62519, 62553, 62584, 62607, 62621, 62632, 62633, 62639, 62640, 62649, 62655, 62661, 62663, 62700, 62701, 62705, 62721, 62730, 62736, 62744, 62754, 62767

CLIMATE
61495, 62042, 62368

CLOUD SEEDING
62065

CLOUDS
62728

CLOVER
61928, 61957, 61961

COAL
61483, 61620, 61734, 61768, 61896, 61901, 61902, 62201, 62205, 62232, 62241, 62248, 62272, 62466, 62467, 62468, 62523, 62555, 62607, 62693, 62697

COAL CLEANING PLANTS
62555

COAL CONVERSION
61483, 62287, 62523, 62607

COAL PREPARATION
62290

COATING, ENGRAVING AND ALLIED SERVICES
61783, 62161, 62686

COBALT COMPOUNDS
61380, 61636, 61653, 62076

CODES
62444, 62726

CODES OF PRACTICE
62450

COKE
62198, 62218

COLLECTORS (MECHANICAL)
62245, 62321

COLLOIDS
61906

COLORADO
62253, 62312, 62402, 62440, 62443, 62681, 62782

COLORIMETRY
61901, 61902, 61917, 62539, 62665

COMBUSTION
61358, 61776, 61869, 62375, 62459

COMBUSTION PRODUCTS
61381, 61441, 61494, 61642, 61663, 61858, 61901, 61924, 62121, 62218, 62280, 62311, 62313, 62334, 62336, 62358, 62381, 62382, 62545, 62564, 62587, 62588, 62589, 62598, 62599, 62600, 62601, 62602, 62603, 62604, 62677, 62678, 62679, 62680, 62681, 62682, 62683, 62684, 62715, 62783

COMMERCIAL EQUIPMENT
62244, 62246, 62530

COMMERCIAL FIRMS
62235, 62236, 62238, 62239, 62242, 62246, 62261, 62262, 62270, 62281, 62299, 62306, 62351, 62373, 62432, 62437, 62453, 62466, 62479, 62505, 62516, 62534, 62580, 62608, 62624, 62633, 62639, 62702, 62731, 62738, 62739, 62752, 62753, 62758, 62794

COMMON COLD
61394, 61442, 61445, 61525, 61566, 61584, 61585, 61607, 61631, 61664

COMPLAINTS
61407, 61488, 61525, 61564, 61582, 61591, 61599, 61604, 61845, 62417, 62448, 62606, 62609, 62685, 62686, 62693, 62698, 62700, 62702, 62766, 62770, 62779, 62795

COMPLEX SOURCES
62531, 62632

COMPLIANCE (RESPIRATORY)
61433, 61532, 61702, 61880

COMPLIANCE SCHEDULES
62384, 62407, 62485, 62491, 62493, 62494, 62504, 62505, 62536, 62548, 62549, 62550, 62551, 62552, 62556, 62559, 62597, 62704

COMPOSTING
62727

COMPUTER PROGRAMS
61353, 61456, 61887, 62233, 62257, 62424, 62510, 62577, 62667, 62712

COMPUTER TERMINALS
62665

COMPUTERS
61892, 62167, 62665, 62694, 62712

CONCRETE
62218

CONDENSATION
62215

CONDENSATION (ATMOSPHERIC)
61796, 62003, 62219, 62728

CONIFERS
61783, 61927, 61936, 61952, 61966, 61968, 61974, 61975, 61976, 61994, 61995, 62006, 62011, 62019, 62021, 62023, 62056, 62060, 62061, 62069, 62080, 62113, 62143, 62148, 62158, 62168, 62169

CONNECTICUT
62554

CONSTRUCTION INDUSTRY
62438, 62449, 62519, 62553, 62556, 62573, 62685, 62686

CONSTRUCTION MATERIALS
61771, 61896, 62208, 62216, 62218, 62219, 62222, 62225, 62229, 62230, 62282, 62322, 62449

CONSTRUCTION OTHER THAN BUILDING CONSTRU
62438, 62553, 62556, 62685

CONSTRUCTION-SPECIAL TRADES
62449

CONSULTANTS
62577

CONTINUOUS
62508, 62545

CONTINUOUS MONITORING
62334, 62431, 62436 62487, 62506, 62568, 62665, 62712

CONTRACTING
62262, 62438, 62519, 62715

CONTROL AGENCIES
62097, 62260, 62262, 62300, 62315, 62346, 62350, 62351, 62356, 62357, 62358, 62365, 62370, 62373, 62377, 62380, 62381, 62382, 62393, 62394, 62406, 62409, 62416, 62424, 62432, 62435, 62437, 62440, 62441, 62442, 62443, 62444, 62445, 62446, 62448, 62449, 62450, 62461, 62464, 62475, 62479, 62480, 62481, 62485, 62503, 62505, 62516, 62528, 62535, 62539, 62540, 62544, 62580, 62590, 62608, 62615, 62618, 62619, 62622, 62630, 62632, 62633, 62639, 62644, 62653, 62661, 62663, 62686, 62694, 62705, 62712, 62713, 62714, 62720, 62726, 62737, 62740, 62745, 62757, 62795

CONTROL PROGRAMS
61849, 62097, 62235, 62242, 62252, 62258, 62269, 62270, 62274, 62276, 62281, 62285, 62337, 62344, 62347, 62351, 62355, 62357, 62362, 62363, 62368, 62373, 62375, 62376, 62378, 62383, 62384, 62386, 62388, 62391, 62395, 62399, 62402, 62403, 62404, 62407, 62408, 62412, 62415, 62443, 62447, 62456, 62459, 62469, 62470, 62477, 62484, 62485, 62486, 62487, 62488, 62489, 62490, 62491, 62492, 62493, 62494, 62495, 62498, 62499, 62501, 62504, 62505, 62509, 62510, 62511, 62512, 62513, 62518, 62519, 62521, 62524, 62525, 62526, 62528, 62529, 62530, 62531, 62532, 62533, 62536, 62542, 62544, 62545, 62547, 62548, 62549, 62550, 62551, 62552, 62553, 62554, 62556, 62559, 62566, 62570, 62571, 62572, 62578, 62584, 62586, 62587, 62588, 62589, 62591, 62592, 62593, 62594, 62595, 62596, 62597, 62598, 62599, 62600, 62601, 62602, 62603, 62604, 62620, 62626, 62629, 62631, 62632, 62633, 62639, 62640, 62641, 62644, 62646, 62649, 62655, 62658, 62668, 62672, 62673, 62674, 62675, 62676, 62677, 62678, 62679, 62680, 62681, 62682, 62683, 62684, 62687, 62691, 62692, 62697, 62703, 62704, 62705, 62710, 62711, 62713, 62715, 62717, 62718, 62720, 62721, 62723, 62731, 62732, 62735, 62736, 62738, 62739, 62741, 62743, 62745, 62752, 62754, 62755, 62757, 62762, 62764, 62773, 62793

CONTROLLED ATMOSPHERES
61622

COOLING
62233

COOLING TOWERS
62233, 62257, 62636

COPPER
62200, 62224, 62226, 62229, 62279, 62709

COPPER COMPOUNDS
61380, 61582, 61652, 61653, 61659, 61687, 61688, 61730, 61738, 61774, 61798, 61921, 61947, 61953, 61984, 61999, 62020, 62047, 62048, 62058, 62076, 62079, 62080, 62525

COPPER PRIMARY SMELTING AND REFINING
61452, 61518, 61733, 61984, 62234, 62403, 62404, 62503, 62549

CORN
61951, 61959, 61988, 62050, 62052

CORROSION
61901, 62208, 62210, 62215, 62220, 62221, 62223, 62224, 62228, 62231, 62780

COSMIC RAYS
62312

COST ANALYSIS
62233, 62241, 62245, 62250, 62256, 62263, 62267, 62401, 62412, 62437, 62631, 62647, 62692

COSTS
62212, 62213, 62232, 62237, 62238, 62239, 62240, 62242, 62244, 62247, 62248, 62251, 62252, 62253, 62256, 62257, 62258, 62259, 62260, 62264, 62268, 62271, 62273, 62276, 62277, 62278, 62279, 62280, 62281, 62283, 62284, 62285, 62286, 62371, 62391, 62481, 62523, 62610, 62624, 62631, 62643, 62654, 62662, 62687, 62693, 62709, 62711, 62713, 62714, 62715, 62717, 62749, 62753, 62762, 62764, 62771, 62772, 62773, 62774, 62777, 62782, 62792

COTTON
61884, 61951, 61986

COTTONS
61742

COUGH
61349, 61350, 61356, 61389, 61399, 61419, 61514, 61532, 61580, 61585, 61597, 61599, 61607, 61631, 61649, 61661, 61662, 61664, 61717, 61721, 61729, 61817, 61848, 61851, 61868, 61884

COUNTY GOVERNMENTS
61567, 62377, 62378, 62444, 62481, 62529, 62742, 62757

CRACKING
61901, 62220, 62221

CRANKCASE EMISSIONS
62497, 62716

CRITERIA
61515, 61678, 61939, 62240, 62313, 62316, 62319, 62325, 62326, 62327, 62328, 62330, 62332, 62334, 62358, 62361, 62381, 62382, 62400, 62416, 62432, 62435, 62449, 62469, 62482, 62500, 62526, 62535, 62540, 62542, 62578, 62583, 62617, 62636, 62639, 62640, 62689, 62721, 62722, 62728, 62732, 62733, 62749, 62750, 62762, 62765

CROP SERVICES
62205, 62375

CROP SPRAYING
62205

CROPS
61668, 61783, 61798, 61818, 61884, 61928, 61929, 61935, 61940, 61941, 61944, 61945, 61947, 61950, 61951, 61952, 61955, 61957, 61958, 61959, 61961, 61962, 61967, 61975, 61978, 61980, 61983, 61986, 61988, 62001, 62004, 62007, 62015, 62029, 62030, 62032, 62033, 62034, 62039, 62041, 62042, 62050, 62052, 62053, 62062, 62074, 62075, 62076, 62078, 62089, 62092, 62093, 62096, 62097, 62099, 62101, 62103, 62107, 62108, 62117, 62118, 62122, 62130, 62131, 62133, 62147, 62155, 62162, 62173, 62175, 62176, 62184, 62206, 62207, 62280

CRUDE OIL
62220, 62221

CRYSTAL STRUCTURE
62210

CUCUMBERS
61951, 62026, 62172

CUMULATIVE MEASUREMENT METHODS
62305

CUPOLAS
62268

CYANATES
61613, 61691

CYANIDES
61351, 61755, 61777

CYCLIC ALKANES
62209

CZECHOSLOVAKIA
61463, 61557, 61676, 61677, 61679, 61682, 61751, 61766, 61817, 61828, 61889, 61890, 61984, 62122, 62195, 62325, 62326, 62327, 62328, 62431, 62713

D

DATA ANALYSIS
61456, 61892, 62243, 62261, 62277, 62424, 62465, 62515, 62666, 62712

DATA HANDLING SYSTEMS
61353, 61456, 61887, 61892, 62233, 62243, 62257, 62261, 62277, 62346, 62349, 62350, 62356, 62398, 62424, 62465, 62510, 62515, 62538, 62563, 62568, 62577, 62630, 62637, 62652, 62664, 62665, 62666, 62667, 62694, 62712

DATA RETRIEVAL
62424, 62630

DECIDUOUS TREES
62011, 62023, 62024, 62056, 62084, 62085, 62093, 62113, 62122, 62148

DECISIONS
62345, 62625, 62655, 62669, 62700, 62707

DECOMPOSITION
61358

DELAWARE
62284, 62575

DENMARK
61694, 61735, 61739, 61801, 61852, 62662

DEOXYRIBONUCLEIC ACIDS
61480, 61685, 61689, 61710

DEPOSITION
61818, 61824, 61832, 61833, 61886, 61898, 61902

DEPOSITION (RESPIRATORY)
61369, 61370, 61466, 61485, 61620, 61695, 61706, 61802

DEPOSITION PHENOMENA
61989, 62050, 62093, 62104, 62580, 62590

DIAGNOSIS
61374, 61398, 61401, 61431, 61467, 61496, 61543, 61552, 61575, 61597, 61671, 61684, 61711, 61764, 61765, 61855, 61868, 61875, 61881, 61884, 61885, 61902, 61917, 61940, 62059, 62114, 62187, 62194, 62202

DIESEL ENGINES
61830, 62237, 62502, 62620, 62634, 62647, 62746

DIFFUSION (ATMOSPHERIC)
61707, 62120, 62297, 62340, 62424, 62447, 62465, 62496, 62503, 62505, 62512, 62522, 62527, 62577, 62612, 62640, 62658, 62697, 62703, 62797

DIFFUSION MODELS
61707, 62297, 62340, 62424, 62447, 62465, 62496, 62503, 62505, 62512, 62522, 62527, 62577, 62640, 62658, 62697, 62703, 62797

DIFFUSION PHENOMENA
61774, 62064

DIGESTIVE SYSTEM
61376, 61377, 61419, 61427, 61450, 61462, 61463, 61465, 61 81, 61507, 61512, 61513, 61529, 61537, 61548, 61556, 61558, 61559, 61620, 61630, 61654, 61675, 61730, 61755, 61816, 61820, 61829, 61838, 61900, 61922, 62067, 62156, 62202

DIMETHYL DISULFIDE
62305

DISCOLORATION
61901, 62227

DISPERSIONS
61906

DISSOCIATION
61454

DOGS
61460, 61517, 61628, 61651, 61652, 61684, 61692, 61810, 61826, 61844, 61908

DOMESTIC HEATING
61895, 62722, 62728

DROPLETS
61824

DRUGS
61462, 61579, 61612, 61730, 61747, 61864, 61886, 62390

DRY CLEANING PLANTS (EXCEPT RUG)
62613

DUMPS
62727

DUST FALL
61375, 61679, 62078, 62396

DUSTS
61375, 61376, 61378, 61383, 61386, 61387, 61390, 61399, 61439, 61446, 61451, 61466, 61481, 61482, 61484, 61486, 61488, 61499, 61508, 61518, 61522, 61546, 61562, 61563, 61565, 61566, 61571, 61578, 61581, 61582, 61583, 61585, 61587, 61591, 61594, 61614, 61615, 61620, 61637, 61652, 61656, 61658, 61669, 61671, 61676, 61679, 61681, 61684, 61716, 61730, 61736, 61742, 61756, 61771, 61777, 61788, 61797, 61801, 61805, 61817, 61834, 61851, 61862, 61867, 61868, 61884, 61896, 61919, 61924, 61937, 61960, 61977, 61979, 61990, 61999, 62014, 62036, 62037, 62050, 62053, 62060, 62097, 62108, 62110, 62163, 62168, 62171, 62175, 62185, 62197, 62201, 62202, 62245, 62261, 62268, 62321, 62368, 62435, 62448, 62521, 62538, 62565, 62573, 62580, 62582, 62614, 62696, 62712, 62715, 62718, 62722, 62729

DYNAMOMETERS
62537

E

ECONOMIC LOSSES
62097, 62199, 62229, 62236, 62255, 62280, 62282, 62749, 62771, 62777

ECONOMICS
61536, 61849, 62097, 62199, 62212, 62213, 62229, 62232, 62233, 62234, 62235, 62236, 62237, 62238, 62239, 62240, 62241, 62242, 62243, 62244, 62245, 62246, 62247, 62248, 62249, 62250, 62251, 62252, 62253, 62254, 62255, 62256, 62257, 62258, 62259, 62260, 62261, 62263, 62264, 62265, 62266, 62267, 62268, 62269, 62270, 62271, 62272, 62273, 62274, 62276, 62277, 62278, 62279, 62280, 62281, 62282, 62283, 62284, 62285, 62286, 62289, 62290, 62371, 62391, 62392, 62401, 62412, 62415, 62418, 62437, 62439, 62447, 62481, 62523, 62542, 62566, 62570, 62610, 62624, 62631, 62636, 62643, 62647, 62650, 62654, 62659, 62662, 62687, 62691, 62692, 62693, 62695, 62709, 62710, 62711, 62713, 62714, 62715, 62717, 62749, 62753, 62761, 62762, 62763, 62764, 62766, 62768, 62771, 62772, 62773, 62774, 62777, 62782, 62792

EDUCATION
62335, 62351, 62458, 62515, 62724, 62732, 62778

EFFICIENCY
61467, 62015, 62283, 62298, 62315, 62439, 62498

ELECTRIC BATTERIES
61922

ELECTRIC FURNACES
62245, 62268

ELECTRIC POWER GENERATION
61618, 61663, 61744, 61768, 62032, 62075, 62110, 62121, 62155, 62215, 62233, 62241, 62248, 62250, 62257, 62266, 62272, 62281, 62291, 62322, 62334, 62337, 62354, 62377, 62379, 62381, 62434, 62466, 62467, 62468, 62487, 62488, 62509, 62522, 62545, 62585, 62607, 62634, 62636, 62693, 62695, 62697, 62698, 62702, 62725, 62728, 62757, 62782, 62783, 62785, 62795

ELECTRIC POWER SOURCES
61776, 61922, 62634

ELECTRIC, GAS, AND SANITARY SERVICES
61367, 61618, 61663, 61744, 61768, 61792, 61869, 61872, 62032, 62075, 62110, 62121, 62155, 62215, 62233, 62241, 62248, 62250, 62257, 62266, 62272, 62278, 62281, 62291, 62313, 62322, 62333, 62334, 62337, 62344, 62345, 62354, 62358, 62377, 62379, 62381, 62382, 62420, 62434, 62466, 62467, 62468, 62470, 62487, 62488, 62489, 62499, 62509, 62522, 62545, 62555, 62573, 62585, 62607, 62612, 62634, 62636, 62651, 62693, 62695, 62697, 62698, 62702, 62704, 62725, 62727, 62728, 62737, 62757, 62782, 62783, 62785, 62795

ELECTRICAL INSULATORS
62217

ELECTRICAL MEASUREMENT DEVICES
61692

ELECTRICAL PROPERTIES
61879, 61979, 62217, 62226

ELECTRICAL RESISTANCE
61979, 62226

ELECTROCHEMICAL METHODS
62665

ELECTROMETALLURGICAL PRODUCTS MILLS
61658, 62500, 62558

ELECTROSTATIC PRECIPITATORS
62240, 62248, 62279

ELM TREES
62056

EMERGENCIES
61608, 62097, 62385, 62517, 62664

EMISSION FACTORS
62244, 62255, 62313, 62335, 62346, 62350, 62414, 62520, 62637, 62638, 62703

EMISSION INVENTORIES
62255, 62335, 62340, 62356, 62424, 62452, 62563, 62572, 62576, 62577, 62637, 62638, 62658, 62691, 62722

EMISSION STANDARDS
61534, 61536, 61767, 61884, 62235, 62237, 62257, 62272, 62299, 62300, 62301, 62305, 62306, 62307, 62309, 62310, 62311, 62314, 62320, 62322, 62323, 62324, 62331, 62332, 62334, 62339, 62342, 62344, 62348, 62353, 62360, 62371, 62377, 62379, 62380, 62385, 62393, 62394, 62395, 62417, 62420, 62430, 62433, 62441, 62443, 62446, 62453, 62472, 62497, 62498, 62502, 62507, 62509, 62512, 62521, 62526, 62532, 62533, 62537, 62542, 62545, 62549, 62551, 62555, 62556, 62562, 62578, 62580, 62584, 62585, 62587, 62588, 62589, 62591, 62592, 62593, 62594, 62595, 62596, 62597, 62605, 62608, 62609, 62610, 62611, 62613, 62614, 62623, 62624, 62628, 62634, 62649, 62675, 62676, 62688, 62696, 62710, 62715, 62716, 62730, 62732, 62733, 62746, 62750, 62782

EMPHYSEMA
61372, 61375, 61387, 61398, 61419, 61435, 61436, 61437, 61443, 61498, 61514, 61548, 61563, 61570, 61585, 61607, 61615, 61700, 61712, 61716, 61760, 61804, 61811, 61817, 61821, 61884, 61886, 61916, 62739

ENFORCEMENT PROCEDURES
61899, 62270, 62309, 62323, 62324, 62330, 62351, 62358, 62365, 62379, 62381, 62382, 62384, 62399, 62432, 62435, 62472, 62475, 62477, 62526, 62544, 62597, 62632, 62633, 62639, 62663, 62668, 62671, 62688, 62705, 62706, 62713, 62714, 62720, 62721, 62726, 62730, 62736, 62740, 62757, 62763, 62769, 62788

ENGINE DESIGN MODIFICATION
62230, 62605, 62634, 62647

ENGINE EMISSIONS
61352, 61362, 61368, 61387, 61407, 61412, 61421, 61434, 61446, 61455, 61477, 61490, 61504, 61536, 61539, 61560, 61580, 61596, 61605, 61614, 61645, 61647, 61677, 61684, 61705, 61706, 61707, 61708, 61714, 61716, 61720, 61759, 61789, 61806, 61830, 61858, 61869, 61871, 61878, 61882, 61895, 61905, 61911, 61937, 61949, 62000, 62020, 62022, 62057, 62073, 62086, 62141, 62187, 62274, 62299, 62306, 62307, 62316, 62320, 62323, 62324, 62331, 62341, 62352, 62354, 62371, 62388, 62393, 62402, 62412, 62415, 62427, 62430, 62432, 62472, 62481, 62495, 62497, 62502, 62507, 62513, 62529, 62533, 62542, 62547, 62553, 62562, 62566, 62610, 62611, 62620, 62634, 62640, 62647, 62649, 62659, 62687, 62692, 62712, 62715, 62716, 62717, 62718, 62728, 62731, 62736, 62746, 62749, 62757, 62767, 62795

ENGINE OPERATING CYCLES
62230, 62454, 62537, 62746

ENGINE OPERATION MODIFICATION
61560, 62634, 62723

ENGINEERS
62335, 62343, 62721, 62763, 62769, 62778, 62785

ENGINES
61830, 62237, 62393, 62502, 62605, 62620, 62634, 62647, 62746

ENZYMES
61368, 61372, 61396, 61408, 61413, 61418, 61429, 61431, 61446, 61470, 61479, 61490, 61510, 61513, 61540, 61552, 61574, 61601, 61612, 61617, 61645, 61648, 61677, 61686, 61717, 61730, 61755, 61760, 61773, 61784, 61800, 61803, 61811, 61816, 61829, 61838, 61839, 61848, 61857, 61864, 61867, 61874, 61877, 61878, 61904, 61906, 61926, 62146, 62151, 62156, 62182

EPIDEMIOLOGY
61390, 61409, 61410, 61430, 61435, 61448, 61452, 61457, 61472, 61475, 61482, 61483, 61485, 61488, 61493, 61494, 61498, 61515, 61516, 61522, 61531, 61538, 61539, 61547, 61557, 61564, 61573, 61578, 61580, 61582, 61592, 61603, 61605, 61607, 61619, 61623, 61625, 61634, 61638, 61641, 61645, 61653, 61655, 61656, 61662, 61664, 61665, 61668, 61669, 61676, 61694, 61698, 61700, 61704, 61712, 61726, 61732, 61733, 61735, 61737, 61748, 61749, 61751, 61752, 61753, 61762, 61766, 61767, 61772, 61776, 61779, 61780, 61783, 61786, 61795, 61801, 61810, 61811, 61813, 61821, 61827, 61840, 61849, 61859, 61868, 61873, 61878, 61881, 61892, 61895, 61897, 61905, 61909, 62083, 62396, 62455, 62590, 62765

EPITHELIUM
61374, 61410, 61424, 61425, 61428, 61470, 61517, 61518, 61548, 61588, 61593, 61651, 61654, 61672, 61701, 61740, 61818, 61847, 61907

EQUIPMENT CRITERIA
62334, 62432, 62749

EQUIPMENT STANDARDS
62295, 62314, 62321, 62322, 62363, 62721

ERYTHROCYTES
61388, 61408, 61418, 61429, 61431, 61446, 61458, 61475, 61551, 61594, 61601, 61606, 61650, 61710, 617[illegible], 61714, 61831, 61864

ESTERS
61718, 62398

ETHERS
61482, 61595, 61627, 61675, 62209

ETHNIC FACTORS
61751, 62760

ETHYL ALCOHOL
61900

ETHYLENE
61447, 61841, 61935, 61939, 61949, 62028, 62116, 62153, 62176, 62179, 62181, 62190, 62211, 62665

EUROPE
61365, 61404, 61405, 61447, 61450, 61451, 61453, 61454, 61457, 61461, 61463, 61464, 61465, 61467, 61472, 61474, 61475, 61476, 61479, 61480, 61481, 61484, 61485, 61486, 61492, 61493, 61495, 61496, 61498, 61499, 61508, 61522, 61531, 61549, 61554, 61555, 61557, 61563, 61577, 61579, 61596, 61600, 61609, 61611, 61615, 61618, 61619, 61620, 61621, 61629, 61630, 61635, 61639, 61640, 61641, 61642, 61643, 61645, 61647, 61659, 61671, 61674, 61676, 61677, 61678, 61679, 61681, 61682, 61690, 61693, 61694, 61696, 61730, 61735, 61736, 61737, 61738, 61739, 61741, 61742, 61743, 61747, 61749, 61751, 61752, 61755, 61756, 61765, 61766, 61767, 61769, 61770, 61771, 61773, 61774, 61777, 61779, 61784, 61786, 61788, 61789, 61790, 61794, 61796, 61801, 61804, 61809, 61811, 61812, 61813, 61816, 61817, 61818, 61819, 61820, 61824, 61828, 61829, 61830, 61831, 61833, 61835, 61836, 61837, 61838, 61839, 61843, 61846, 61847, 61848, 61849, 61852, 61853, 61856, 61857, 61862, 61863, 61864, 61865, 61866, 61869, 61870, 61876, 61881, 61888, 61889, 61890, 61896, 61897, 61900, 61902, 61903, 61907, 61909, 61911, 61912, 61913, 61914, 61918, 61919, 61920, 61922, 61923, 61924, 61927, 61984, 61985, 61987, 61999, 62000, 62001, 62005, 62006, 62022, 62051, 62053, 62054, 62066, 62084, 62114, 62115, 62122, 62136, 62140, 62143, 62148, 62150, 62151, 62154, 62156, 62165, 62166, 62168, 62195, 62198, 62199, 62201, 62202, 62203, 62204, 62210, 62212, 62215, 62216, 62217, 62218, 62219, 62222, 62223, 62225, 62226, 62228, 62229, 62232, 62237, 62245, 62248, 62250, 62256, 62268, 62270, 62281, 62282, 62283, 62292, 62297, 62302, 62317, 62318, 62319, 62325, 62326, 62327, 62328, 62329, 62338, 62342, 62343, 62345, 62352, 62357, 62359, 62360, 62362, 62363, 62368, 62369, 62372, 62386, 62389, 62398, 62399, 62401, 62405, 62408, 62409, 62411, 62423, 62425, 62431, 62433, 62434, 62447, 62448, 62465, 62474, 62481, 62482, 62483, 62514, 62516, 62521, 62543, 62564, 62565, 62569, 62570, 62571, 62579, 62612, 62613, 62614, 62616, 62617, 62620, 62621, 62622, 62625, 62641, 62647, 62648, 62653, 62662, 62665, 62670, 62689, 62691, 62696, 62699, 62706, 62713, 62715, 62722, 62727, 62729, 62765, 62770, 62781, 62785, 62787, 62789, 62791

EVAPORATION
62138

EXCRETIONS
61367, 61377, 61382, 61400, 61405, 61418, 61419, 61427, 61431, 61449, 61453, 61463, 61467, 61473, 61485, 61509, 61526, 61582, 61588, 61590, 61619, 61648, 61654, 61655, 61668, 61670, 61714, 61717, 61730, 61763, 61767, 61783, 61793, 61798, 61805, 61841, 61855, 61862, 61863, 61877, 61878, 61888, 61891, 61906, 61917, 61922, 62202

EXERCISE
61491, 61913

EXHAUST SYSTEMS
61600, 62449

EXPERIMENTAL EQUIPMENT
62722

EXPERIMENTAL METHODS
61500, 61938

EXPLOSIONS
61846, 62148

EXPOSURE CHAMBERS
61646, 61943, 62208, 62214

EXPOSURE METHODS
61368, 61462, 61484, 61497, 61540, 61554, 61577, 61602, 61634, 61706, 61707, 61747, 61775, 61781, 61787, 61790, 61799, 61819, 61835, 61837, 61847, 61852, 61855, 61857, 61874, 61880, 61886, 61887, 61908, 61910, 61923, 61924, 61951, 61986, 62046, 62109, 62115, 62126, 62147, 62180, 62202, 62208

EXTERNAL COMBUSTION ENGINES
62634

EYE IRRITATION
61363, 61389, 61403, 61410, 61415, 61427, 61513, 61523, 61550, 61562, 61574, 61580, 61584, 61591, 61608, 61624, 61625, 61657, 61661, 61719, 61724, 61789, 61827, 61845, 61851, 61885, 61901

EYES
61363, 61371, 61517, 61574, 61876, 61885, 61901

F

FABRIC FILTERS
62279, 62315, 62367, 62729

FALLOUT
61888

FANS (BLOWERS)
61600

FARMS
61563, 61668, 61798, 61990, 62062, 62075, 62202, 62207, 62609

FAT AND OIL PRODUCTION
62273

FEASIBILITY STUDIES
62526, 62692, 62709

FECES
61377

FEES
62402, 62542, 62643, 62655, 62710, 62713

FERROALLOY PRODUCTION-E
61658, 62500, 62558

FERROALLOYS
62231

FERROMANGANESE PRODUCTION-E
61658

FIELD TESTS
61493, 62367, 62722

FILTERS
61467, 62240, 62245, 62279, 62298, 62315, 62367, 62613, 62729

FINANCING
62248, 62570, 62654, 62659, 62695

FINLAND
61531, 62168, 62409, 62722

FIR TREES
61927

FIRING METHODS
62218, 62252

FISH
61865

FLAME IONIZATION DETECTOR (CO)
61779

FLAMES
61358, 61776

FLORIDA
61953, 62498, 62509, 62676

FLOWERS
61783, 61930, 61932, 61935, 61946, 61963, 62007, 62009, 62010, 62012, 62032, 62035, 62041, 62045, 62061, 62063, 62072, 62081, 62087, 62088, 62093, 62099, 62100, 62129, 62130, 62131, 62141, 62142, 62164, 62178, 62193

FLUID FLOW
61824, 62322, 62577

FLUORANTHENES
62051

FLUORESCENCE
61853

FLUORIDES
61414, 61427, 61440, 61499, 61588, 61629, 61648, 61654, 61668, 61774, 61877, 61951, 61952, 61972, 61991, 62006, 62012, 62041, 62056, 62062, 62067, 62068, 62087, 62088, 62089, 62093, 62096, 62139, 62145, 62146, 62152, 62166, 62178, 62190, 62289, 62293, 62314, 62525, 62561, 62565, 62756, 62758

FLUORINATED HYDROCARBONS
61460, 61541, 61683, 62209, 62656

FLUORINE
61414, 61427, 61440, 61777, 61952, 62087, 62090, 62091, 62094, 62131, 62133, 62134, 62154, 62372, 62525

FLUORINE COMPOUNDS
61414, 61419, 61427, 61440, 61499, 61588, 61590, 61611, 61629, 61648, 61654, 61668, 61774, 61783, 61820, 61877, 61931, 61936, 61937, 61951, 61952, 61972, 61991, 62006, 62012, 62014, 62040, 62041, 62056, 62061, 62062, 62067, 62068, 62069, 62087, 62088, 62089, 62090, 62091, 62093, 62094, 62095, 62096, 62097, 62099, 62101, 62102, 62114, 62139, 62145, 62146, 62152, 62162, 62163, 62166, 62168, 62172, 62178, 62188, 62190, 62194, 62204, 62240, 62289, 62293, 62314, 62525, 62561, 62565, 62756, 62758

FLUOROSIS
61820, 62204

FLY ASH
61582, 62052

FOG
61796, 62003, 62219

FOOD
61596, 61668, 61798, 62001, 62017, 62095, 62390

FOOD AND KINDRED PRODUCTS INDUSTRY
61493, 61520, 62273, 62533, 62685

FORESTRY BURNING
62573

FORESTS
61936, 61953, 61976, 61993, 62079, 62084, 62112, 62143, 62148, 62168, 62199, 62204, 62573, 62728

FORMALDEHYDES
61513, 61522, 61523, 61550, 61627, 61775, 61844, 62035, 62226, 62339

FRANCE
61454, 61461, 61611, 61618, 61647, 61751, 61774, 61786, 61789, 61794, 61813, 61846, 61849, 61914, 61920, 61927, 61987, 61999, 62022, 62342, 62431, 62482, 62570, 62662, 62706, 62713, 62715, 62729, 62787

FRUITS
61954, 61975, 61986, 62000, 62004, 62011, 62014, 62017, 62018, 62056, 62073, 62082, 62086, 62087, 62088, 62092, 62093, 62095, 62101, 62102, 62105, 62111, 62116, 62134, 62144, 62145, 62163, 62178, 62185, 62186, 62187 62188, 62189, 62191, 62192, 62194, 62197, 62203, 62206

FUEL ADDITIVES
61368, 61477, 61706, 61707, 62177, 62230, 62331, 62557, 62611, 62616, 62723

FUEL ASH CONTENT
62447

FUEL CHARACTERISTICS
61618, 62215, 62248, 62272, 62305, 62342, 62352, 62371, 62387, 62447, 62472, 62488, 62496, 62533, 62552, 62605, 62608, 62634, 62673, 62674, 62693, 62697

FUEL CHARGING
62218

FUEL CRITERIA
62334, 62617

FUEL EVAPORATION
62323, 62324, 62507, 62529, 62533, 62553, 62566, 62757

FUEL GASES
61776, 62211, 62257, 62466, 62467, 62468, 62545, 62564, 62585, 62609

FUEL OIL PREPARATION
62220, 62221, 62387

FUEL OILS
61381, 61663, 62220, 62221, 62248, 62251, 62272, 62352, 62466, 62467, 62468, 62533, 62534, 62555, 62617, 62693

FUEL STANDARDS
62239, 62305, 62331, 62387, 62472, 62496, 62537, 62547, 62587, 62588, 62611, 62673, 62674

FUEL SUBSTITUTION
62252

FUEL SULFUR CONTENT
61618, 62215, 62248, 62272, 62305, 62342, 62352, 62447, 62488, 62496, 62533, 62552, 62605, 62608, 62634, 62673, 62674, 62693, 62697

FUEL TANK EVAPORATION
62507

FUEL TREATMENT
61483, 62220, 62221, 62241, 62287, 62290, 62387, 62447, 62523, 62607

FUEL USAGE
62240, 62362, 62607, 62608, 62610, 62611, 62634

FUGITIVE DUST SOURCES
62494, 62503, 62549, 62556, 62580

FUMES
61404, 61681, 61797, 61869, 62328, 62561, 62623, 62729, 62779

FUNGAL EFFECTS
62059

FUNGI
62080, 62115, 62135, 62206

FURNACES
62201, 62218, 62245, 62268, 62360, 62485, 62612

G

GARAGES
61830

GAS CHROMATOGRAPHY
61503, 61779, 61926, 62304, 62653

GAS SAMPLING
62647, 62656

GAS TURBINE ENGINES
62393, 62634

GASIFICATION
61483, 62287, 62523

GASOLINE SERVICE STATIONS
62529, 62533, 62566

GASOLINES
61352, 61434, 61682, 61830, 61838, 61839, 62230, 62239, 62253, 62274, 62352, 62472, 62507, 62533, 62547, 62550, 62557, 62566, 62611, 62616, 62650, 62723

GENETICS
61482, 61498, 61586, 61627, 61771, 61786, 61988, 62146, 62152

GEORGIA
62488, 62576

GERANIUM
62032

GERMAN DEMOCRATIC REPUBLIC
61481, 61508, 61609, 61630, 61640, 61682, 61812, 61836, 62405, 62514, 62696

GERMANY, FEDERAL REPUBLIC
61365, 61405, 61447, 61451, 61453, 61465, 61472, 61474, 61475, 61476, 61479, 61480, 61486, 61496, 61579, 61596, 61600, 61615, 61619, 61620, 61621, 61629, 61641, 61645, 61671, 61693, 61742, 61756, 61779, 61784, 61788, 61811, 61824, 61833, 61835, 61857, 61862, 61869, 61870, 61881, 61900, 61902, 61922, 61924, 62001, 62051, 62053, 62084, 62114, 62140, 62150, 62151, 62156, 62165, 62201, 62218, 62228, 62232, 62268, 62270, 62292, 62338, 62342, 62345, 62360, 62363, 62386, 62408, 62411, 62423, 62431, 62433, 62434, 62465, 62474, 62483, 62521, 62543, 62564, 62569, 62570, 62571, 62612, 62613, 62614, 62616, 62622, 62625, 62713, 62727, 62789

GLADIOLUS
61783, 61935, 62041, 62072, 62087, 62088, 62093, 62129, 62130, 62131

GLANDS
61460, 61710, 61765, 61877

GLASS
61896

GLASS MANUFACTURING AND PROCESSING
62095

GLUCOSES
61650

GOATS
62067

GRAIN PROCESSING
62533

GRANTS
62714, 62729, 62744, 62752

GRAPES
62000, 62004, 62144

GRASSES
61958, 62029, 62032, 62034, 62053, 62280

GREAT BRITAIN
61457, 61464 61495, 61643, 61681, 61682, 61749, [illegible], 61769, 61796, 61818, 61830, 61853, 61856, 61896, 61905, 61907, 61909, 61919, 61985, 62006, 62202, 62203, 62225, 62281, 62283, 62357, 62425, 62647, 62662, 62713, 62791

GREENBELTS
62425, 62699

GREENHOUSE EFFECTS
61970

GROUND LEVEL
62205, 62465, 62522, 62577, 62656, 62791, 62797

GROWTH
61377, 61677, 61731, 61769, 61863, 61990

GROWTH REGULATORS
61926

GUINEA PIGS
61364, 61385, 61465, 61535, 61630, 61647, 61706, 61734, 61741, 61759, 61810, 61863, 61864, 61874, 61901, 61910, 62204

GYPSUM
62216

H

HAIR
61479, 61571, 61598, 61614, 61619, 61674, 61738, 61745

HALOGEN GASES
61414, 61427, 61440, 61447, 61466, 61528, 61774, 61777, 61821, 61952, 61953, 62026, 62060, 62087, 62090, 62091, 62094, 62097, 62131, 62133, 62134, 62146, 62154, 62166, 62183, 62190, 62372, 62525, 62561, 62665

HALOGENATED HYDROCARBONS
61447, 61460, 61476, 61507, 61528, 61531, 61541, 61567, 61595, 61627, 61675, 61683, 61741, 61761, 61774, 61777, 61841, 61900, 61912, 61917, 61918, 62179, 62209, 62211, 62255, 62310, 62390, 62398, 62429, 62471, 62613, 62629, 62656

HAMSTERS
61706

HAWAII
62656

HAZARDOUS AIR POLLUTANT STANDARDS
61767, 62300, 62377, 62379, 62380, 62394, 62441, 62443, 62446, 62584

HEADACHE
61389, 61403, 61453, 61499, 61580, 61710, 61719, 61828, 61845, 61851

HEALTH IMPAIRMENT
61351, 61353, 61356, 61362, 61393, 61403, 61404, 61407, 61419, 61441, 61453, 61479, 61485, 61487, 61495, 61499, 61508, 61528, 61531, 61536, 61548, 61555, 61561, 61568, 61576, 61580, 61584, 61596, 61597, 61600, 61608, 61609, 61618, 61623, 61635, 61658, 61659, 61673, 61678, 61682, 61683, 61702, 61705, 61709, 61710, 61717, 61719, 61732, 61734, 61744, 61747, 61751, 61755, 61760, 61768, 61772, 61791, 61792, 61795, 61808, 61809, 61822, 61828, 61830, 61837, 61845, 61846, 61868, 61869, 61870, 61872, 61892, 61910, 61915, 62186, 62194, 62282, 62312, 62329, 62333, 62341, 62396, 62470, 62474, 62590, 62756, 62764, 62771, 62774, 62777

HEALTH STATISTICS
61399, 61457, 61545, 61564, 61645, 61738, 61748, 61801

HEALTH SURVEYS
61353, 61389, 61393, 61399, 61400, 61401, 61407, 61418, 61421, 61443, 61446, 61506, 61561, 61576, 61582, 61599, 61649, 61662, 61669, 61679, 61693, 61699, 61727, 61728, 61738, 61745, 61753, 61764, 61780, 61795, 61805, 61822, 61834, 61918, 62396

HEARINGS
62323, 62459, 62557

HEART
61371, 61396, 61460, 61476, 61545, 61548, 61584, 61609, 61613, 61622, 61628, 61654, 61683, 61733, 61750, 61782, 61785, 61799, 61804, 61807, 61815, 61826, 61882, 61885

HEAT TRANSFER
62233, 62552

HEAVY-DUTY VEHICLES
62502, 62562, 62649

HEIGHT FINDING
62797

HEMATOLOGY
61352, 61365, 61367, 61371, 61377, 61396, 61400, 61413, 61418, 61429, 61434, 61437, 61444, 61446, 61449, 61454, 61460, 61472, 61473, 61485, 61545, 61551, 61555, 61568, 61582, 61594, 61601, 61602, 61606, 61610, 61613, 61619, 61639, 61650, 61659, 61672, 61677, 61690, 61711, 61714, 61715, 61730, 61747, 61755, 61756, 61773, 61779, 61782, 61784, 61785, 61793, 61798, 61803, 61807, 61826, 61828, 61830, 61831, 61837, 61839, 61841, 61842, 61843, [illegible], 61852, 61853, 61855, 61857, 61858, 61863, 61864, 61877, 61878, 61891, 61903, 61904, 61908, 61910, 61911, 61920, 61921, 61922, 62196

HEMOGLOBIN
61365, 61396, 61429, 61434, 61449, 61454, 61555, 61619, 61639, 61650, 61672, 61677, 61714, 61715, 61782, 61784, 61785, 61839, 61864, 61891

HEPA FILTERS
62298

HERBICIDES
61926, 62109, 62138

HERBS
62089, 62093, 62123

HI-VOL SAMPLERS
62295

HIGHWAYS
61448, 61453, 61580, 61596, 61806, 62080, 62086, 62141, 62177, 62191, 62376, 62427, 62438, 62462, 62484, 62510, 62511, 62573, 62699, 62711

HISTAMINES
61884, 61910

HISTOLOGY
61540, 61577, 61593, 61602, 61741, 61790, 61863, 61864, 61913, 62021, 62067, 62349

HISTORICAL ASPECTS
61585, 61662, 61704, 62314, 62409, 62472, 62582, 62634, 62661, 62686, 62688, 62699

HOGS
61496, 61990

HORMONES
62157, 62179

HOUSTON
62550

HUMIDITY
61575, 61845, 61905, 61923, 62003, 62034, 62200, 62208, 62210, 62214, 62219, 62227, 62229, 62657, 62712, 62728

HUNGARY
62297, 62372, 62431, 62565

HYDROCHLORIC ACID
61447, 61583, 61900, 62053, 62158, 62190, 62203, 62229, 62525

HYDROCYANIC ACID
61447, 61760, 61774, 61900, 62525

HYDRODESULFURIZATION
62220, 62221, 62387

HYDROFLUORIC ACID
61440, 61447, 61783, 61927, 61935, 61951, 61972, 61991, 62053, 62067, 62072, 62089, 62093, 62096, 62131, 62172, 62183, 62185, 62188, 62189, 62354

HYDROGEN
62055, 62084

HYDROGEN SULFIDE
61390, 61450, 61755, 61850, 61900, 61901, 61990, 62229, 62247, 62305, 62308, 62424, 62453, 62534, 62627, 62637, 62665, 62723

HYDROSPHERE
62174

HYGROSCOPICITY
61818, 62050

HYPERSENSITIVITY
61384, 61385, 61395, 61535, 61742, 61758, 61810

HYPERVENTILATION
61831

HYPOXIA
61469, 61628, 61799, 61845, 61903

I

IDAHO
62486, 62504, 62530

ILLINOIS
61353, 61815, 62373, 62599, 62703, 62725

IMMUNOLOGY
61355, 61386, 61392, 61396, 61471, 61486, 61497, 61513, 61533, 61542, 61563, 61632, 61673, 61703, 61720, 61742, 61756, 61773, 61781, 61848, 61864

IMPACT STATEMENTS
61732, 62288, 62310, 62361, 62406, 62413, 62420, 62457, 62460, 62461, 62528, 62567, 62573, 62574, 62575, 62618, 62634, 62648

IMPLEMENTATION PLANS
62337, 62344, 62347, 62375, 62376, 62395, 62402, 62459, 62469, 62470, 62484, 62485, 62486, 62488, 62489, 62490, 62491, 62492, 62494, 62495, 62498, 62499, 62501, 62504, 62509, 62519, 62528, 62530, 62531, 62532, 62533, 62544, 62548, 62549, 62551, 62552, 62553, 62554, 62556, 62572, 62584, 62587, 62588, 62589, 62591, 62592, 62593, 62594, 62595, 62596, 62597, 62598, 62599, 62600, 62601, 62602, 62603, 62604, 62639, 62646, 62649, 62673, 62674, 62675, 62676, 62677, 62678, 62679, 62680, 62681, 62682, 62683, 62684, 62687, 62697, 62705

INCENTIVES
62274, 62384, 62634, 62646, 62664, 62761

INCINERATORS (REFUSE)
61869, 62313, 62322, 62344, 62358, 62377, 62379, 62382, 62489, 62499, 62555, 62612, 62725, 62727, 62737, 62757

INCINERATORS (WASTE GASES)
61362, 61368, 61705, 61706, 61707, 61708, 62279, 62605, 62610, 62634

INDIA
61594, 62050, 62425, 62760

INDIANA
62494

INDOOR
61367, 61455, 61499, 61660, 61776, 61870, 61918, 62318, 62657, 62789

INDUSTRIAL AREAS
61350, 61356, 61399, 61400, 61406, 61411, 61472, 61475, 61488, 61505, 61506, 61514, 61544, 61582, 61583, 61584, 61585, 61590, 61603, 61607, 61619, 61623, 61651, 61652, 61656, 61658, 61661, 61662, 61670, 61698, 61783, 61820, 61827, 61834, 61861, 61865, 61868, 61869, 61874, 61877, 61931, 61936, 61956, 61975, 61991, 61995, 61999, 62019, 62044, 62060, 62068, 62073, 62074, 62080, 62083, 62121, 62130, 62156, 62168, 62204, 62206, 62207, 62210, 62281, 62372, 62425, 62525, 62573, 62580, 62582, 62590, 62670, 62690, 62699, 62751, 62760, 62770, 62779

INDUSTRIAL INORGANIC CHEMICAL PLANTS
62054, 62377, 62487, 62498, 62505, 62508, 62530, 62555, 62560

INFECTIOUS DISEASES
61355, 61396, 61398, 61498, 61564, 61603, 61617, 61632, 61706, 61756, 61789, 61791, 61811, 61823, 61848, 61872, 61897

INFLUENZA
61471, 61522, 61791, 61815

INFORMATION RETRIEVAL
62630, 62664

INFRARED RADIATION
61993, 62043

INGESTION
61428, 61460, 61477, 61537, 61559, 61616, 61668, 61787, 61853, 61854, 61891, 61899, 61999, 62017, 62062, 62082, 62114, 62202

INHALATION
61355, 61455, 61460, 61476, 61478, 61484, 61489, 61508, 61530, 61554, 61555, 61577, 61588, 61595, 61609, 61616, 61658, 61691, 61695, 61706, 61734, 61740, 61741, 61759, 61787, 61797, 61810, 61811, 61819, 61826, 61837, 61840, 61844, 61860, 61861, 61883, 61907, 62062, 62114

INHIBITION
61432, 61434, 61479, 61480, 61552, 61559, 61648, 61680, 61756, 61799, 61823, 61857, 61874, 61879, 61904, 61926, 62035, 62065, 62083, 62086, 62126, 62135, 62151, 62179, 62181, 62203

INORGANIC ACIDS
61384, 61440, 61447, 61478, 61494, 61523, 61550, 61583, 61702, 61705, 61706, 61707, 61718, 61734, 61783, 61810, 61900, 61901, 61927, 61935, 61951, 61972, 61979, 61983, 61991, 62053, 62067, 62072, 62089, 62093, 62096, 62131, 62146, 62158, 62161, 62172, 62183, 62185, 62188, 62189, 62190, 62203, 62205, 62218, 62221, 62222, 62229, 62281, 62305, 62322, 62354, 62368, 62508, 62525, 62530, 62560, 62610, 62780

INSECTS
61954, 62017, 62018, 62027, 62031, 62082, 62095, 62102, 62119, 62124, 62135, 62141, 62145, 62154, 62163, 62185, 62186, 62187, 62188, 62189, 62194, 62197

INSPECTION
62323, 62324, 62338, 62365, 62373, 62388, 62407, 62412, 62415, 62454, 62463, 62472, 62495, 62519, 62659, 62692, 62716, 62717, 62731, 62735, 62746, 62757

INSPECTORS
62338, 62358, 62365, 62381, 62382, 62423, 62435, 62449, 62450, 62463, 62464, 62475

INSTRUMENTATION
62656, 62719

INTEGUMENTARY SYSTEM
61479, 61571, 61598, 61614, 61619, 61674, 61738, 61745

INTERMITTENT MONITORING
62665

INTERNAL COMBUSTION ENGINES
61830, 62237, 62502, 62605, 62620, 62634, 62647, 62746

INTERNATIONAL AGENCIES
61849, 62436, 62579, 62581, 62653, 62654

INVERSION
62280, 62525, 62720

INVERTEBRATES
61383, 61954, 62017, 62018, 62027, 62031, 62082, 62095, 62102, 62119, 62124, 62135, 62141, 62145, 62154, 62163, 62185, 62186, 62187, 62188, 62189, 62194, 62197

IODIMETRIC METHODS
62205

IODINE
62060

IODINE COMPOUNDS
62017, 62018, 62097

IONS
61459, 61553, 61611, 61648, 61685, 61686, 61687, 61820, 61972, 62055, 62084, 62085, 62136

IOWA
62493, 62592

IRIS
62061, 62072

IRON
62208, 62224, 62228, 62229, 62231, 62276, 62277, 62729

IRON AND STEEL FOUNDRIES
61493, 61591, 62036, 62037, 62244, 62377, 62624

IRON COMPOUNDS
61376, 61377, 61380, 61482, 61524, 61585, 61620, 61653, 61659, 61736, 61840, 61921,

61953, 61984, 62020, 62037, 62053, 62080, 62175

IRON OXIDES
61582, 62036, 62231

IRRADIATION CHAMBERS
61490, 61707, 62383

ISOBUTANES
62665

ISOTOPES
61482, 61853, 61888, 61898, 62148, 62318

ISRAEL
62667

ITALY
61737, 61741, 61804, 61816, 61820, 61848, 62000, 62212, 62216, 62219, 62222, 62229, 62256, 62270, 62282, 62368, 62369, 62389, 62653, 62689, 62713

J

JAPAN
61349, 61350, 61351, 61352, 61356, 61359, 61363, 61364, 61366, 61367, 61369, 61370, 61371, 61372, 61373, 61374, 61375, 61376, 61377, 61378, 61379, 61380, 61381, 61382, 61383, 61384, 61385, 61386, 61387, 61388, 61389, 61390, 61391, 61392, 61393, 61394, 61395, 61396, 61398, 61399, 61400, 61401, 61402, 61403, 61406, 61407, 61408, 61409, 61410, 61411, 61412, 61413, 61414, 61415, 61416, 61417, 61418, 61419, 61420, 61421, 61422, 61423, 61424, 61425, 61426, 61427, 61428, 61429, 61430, 61431, 61432, 61435, 61436, 61437, 61438, 61439, 61440, 61442, 61443, 61444, 61445, 61448, 61449, 61468, 61473, 61487, 61488, 61489, 61490, 61503, 61504, 61505, 61506, 61509, 61510, 61511, 61512, 61513, 61514, 61515, 61516, 61517, 61518, 61519, 61520, 61521, 61523, 61524, 61525, 61526, 61527, 61528, 61529, 61530, 61533, 61534, 61535, 61537, 61538, 61539, 61541, 61542, 61543, 61544, 61546, 61547, 61548, 61550, 61551, 61556, 61558, 61559, 61561, 61562, 61564, 61565, 61566, 61568, 61570, 61571, 61572, 61573, 61574, 61575, 61576, 61578, 61580, 61581, 61582, 61583, 61584, 61585, 61586, 61587, 61588, 61589, 61590, 61591, 61592, 61593, 61597, 61598, 61599, 61601, 61602, 61603, 61604, 61605, 61606, 61607, 61608, 61623, 61624, 61625, 61626, 61631, 61632, 61633, 61637, 61638, 61648, 61649, 61650, 61651, 61652, 61653, 61654, 61655, 61656, 61657, 61658, 61660, 61661, 61662, 61663, 61664, 61665, 61666, 61667, 61668, 61669, 61670, 61672, 61673, 61680, 61684, 61697, 61698, 61699, 61700, 61701, 61702, 61703, 61704, 61712, 61713, 61714, 61715, 61716, 61717, 61718, 61719, 61720, 61721, 61722, 61723, 61724, 61725, 61726, 61727, 61728, 61729, 61750, 61754, 61757, 61759, 61763, 61764, 61782, 61783, 61791, 61793, 61795, 61798, 61803, 61805, 61806, 61808, 61827, 61841, 61845, 61850, 61851, 61868, 61877, 61882, 61887, 61895, 61910, 61925, 61928, 61929, 61930, 61931, 61932, 61933, 61934, 61935, 61936, 61937, 61938, 61939, 61940, 61941, 61942, 61944, 61945, 61946, 61947, 61948, 61949, 61950, 61952, 61954, 61955, 61956, 61957, 61958, 61959, 61960, 61961, 61962, 61963, 61964, 61965, 61966, 61967, 61968, 61969, 61970, 61971, 61972, 61973, 61974, 61975, 61976, 61977, 61978, 61979, 61980, 61981, 61982, 61983, 61992, 61993, 61994, 61995, 61996, 61997, 61998, 62002, 62003, 62004, 62007, 62008, 62009, 62010, 62011, 62012, 62013, 62014, 62016, 62017, 62018, 62019, 62020, 62021, 62025, 62026, 62027, 62028, 62029, 62031, 62033, 62035, 62036, 62037, 62038, 62039, 62040, 62041, 62042, 62043, 62045, 62047, 62048, 62049, 62057, 62058, 62059, 62060, 62061, 62062, 62063, 62067, 62068, 62069, 62070, 62071, 62072, 62073, 62074, 62075, 62076, 62077, 62078, 62079, 62080, 62081, 62082, 62083, 62086, 62087, 62088, 62089, 62090, 62091, 62092, 62093, 62094, 62095, 62096, 62097, 62098, 62099, 62100, 62101, 62102, 62103, 62104, 62106, 62107, 62108, 62110, 62111, 62112, 62116, 62117, 62118, 62119, 62120, 62123, 62124, 62125, 62127, 62128, 62129, 62130, 62131, 62132, 62133, 62134, 62137, 62138, 62145, 62155, 62158, 62159, 62160, 62161, 62162, 62163, 62164, 62170, 62171, 62172, 62173, 62175, 62176, 62178, 62183, 62184, 62185, 62186, 62187, 62188, 62189, 62192, 62193, 62194, 62197, 62220, 62221, 62224, 62235, 62236, 62244, 62251, 62252, 62254, 62259, 62261, 62270, 62288, 62298, 62299, 62301, 62304, 62307, 62309, 62320, 62321, 62341, 62355, 62416, 62417, 62419, 62420, 62422, 62426, 62427, 62428, 62429, 62430, 62431, 62436, 62437, 62453, 62454, 62455, 62456, 62463, 62476, 62477, 62517, 62518, 62524, 62525, 62526, 62538, 62570, 62581, 62582, 62583, 62585, 62605, 62606, 62608, 62609, 62615, 62624, 62626, 62627, 62628, 62629, 62657, 62668, 62671, 62672, 62685, 62686, 62693, 62698, 62702, 62708, 62712, 62713, 62718, 62767, 62788

JET AIRCRAFT
62393

K

KANAGAWA PREFECTURE
61504, 61506, 61638, 61808, 62025, 62159, 62355

KANSAS
62536

KENTUCKY
62552, 62675

KETONES
61447, 61755, 61900, 62209

KIDNEYS
61352, 61376, 61377, 61450, 61462, 61512, 61537, 61548, 61556, 61558, 61598, 61630, 61648, 61654, 61755, 61765, 61816, 61887, 61900, 61906, 62202

KILNS
62201, 62485

KRAFT (SULFATE) PULPING
62267, 62475, 62485, 62714

L

LABORATORY ANIMALS
61410, 61425, 61465, 61494, 61531, 61707, 61744, 61746, 61748, 61773, 61784, 61800, 61823, 61857, 61875, 61915

LAKES
62174, 62728

LAND USE PLANNING
62152, 62271, 62288, 62347, 62364, 62374, 62391, 62400, 62414, 62434, 62456, 62473, 62573, 62632, 62636, 62640, 62642, 62644, 62655, 62666, 62667, 62671, 62751

LANDFILLS
62727

LANDSCAPE ARCHITECTURE
61994, 62425, 62582, 62699

LARYNGITIS
61642, 61897

LARYNX
61584, 61603, 61636, 61642, 61643

LASERS
62656

LATIN AMERICA
61617, 61807, 61904, 62623, 62662, 62690, 62713

LEAD
62156

LEAD CHLORIDE
62354

LEAD COMPOUNDS
61352, 61361, 61368, 61369, 61370, 61376, 61377, 61380, 61382, 61400, 61403, 61405, 61408, 61418, 61431, 61434, 61444, 61446, 61449, 61453, 61466, 61467, 61472, 61473, 61480, 61509, 61526, 61553, 61569, 61582, 61596, 61614, 61619, 61645, 61652, 61653, 61674, 61681, 61682, 61706, 61707, 61711, 61714, 61730, 61731, 61763, 61771, 61774, 61787, 61793, 61813, 61853, 61854, 61855, 61871, 61878, 61888, 61891, 61899, 61902, 61920, 61922, 61947, 61953, 61954, 61992, 62000, 62001, 62020, 62022, 62047, 62048, 62053, 62058, 62060, 62076, 62079, 62080, 62097, 62105, 62114, 62136, 62141, 62156, 62177, 62191, 62197, 62202, 62230, 62314, 62354, 62371, 62471, 62472, 62525, 62547, 62579, 62580, 62611, 62616, 62662, 62718, 62722, 62723

LEAD PRIMARY SMELTING AND REFINING
61452, 61467, 62580

LEAD SECONDARY SMELTING AND REFINING
61467, 62377

LEADED GASOLINES
61352, 61682, 61838, 61839, 62611, 62616

LEATHER
62229

LEATHER AND LEATHER PRODUCTS INDUSTRY
61568

LEAVES
61927, 61928, 61931, 61934, 61936, 61940, 61950, 61952, 61958, 61961, 61962, 61963, 61966, 61973, 61974, 61978, 61979, 61980, 61981, 61983, 61984, 61987, 61988, 61992, 61993, 61994, 61995, 61996, 61999, 62000, 62001, 62006, 62008, 62011, 62012, 62013, 62014, 62016, 62019, 62021, 62023, 62025, 62026, 62028, 62029, 62030, 62032, 62036, 62037, 62042, 62048, 62050, 62054, 62056, 62059, 62060, 62062, 62063, 62064, 62069, 62071, 62072, 62073, 62080, 62082, 62083, 62085, 62088, 62089, 62093, 62094, 62096, 62098, 62099, 62100, 62104, 62105, 62106, 62107, 62108, 62110, 62116, 62117, 62118, 62120, 62122, 62127, 62128, 62131, 62137, 62140, 62143, 62144, 62147, 62148, 62149, 62158, 62159, 62161, 62162, 62164, 62169, 62170, 62172, 62173, 62175, 62176, 62177, 62178, 62180, 62182, 62185, 62188, 62193, 62194, 62197, 62198, 62199

LEGISLATION
61849, 62237, 62314, 62323, 62324, 62347, 62360, 62373, 62374, 62385, 62391, 62392, 62397, 62406, 62409, 62413, 62415, 62419, 62420, 62432, 62433, 62434, 62438, 62461, 62465, 62466, 62468, 62472, 62474, 62477, 62478, 62490, 62501, 62519, 62526, 62543, 62553, 62578, 62584, 62598, 62599, 62600, 62601, 62602, 62603, 62604, 62605, 62607, 62616, 62617, 62620, 62621, 62622, 62623, 62625, 62627, 62632, 62633, 62634, 62639, 62640, 62641, 62644, 62645, 62647, 62649,

62655, 62657, 62659, 62660, 62661, 62663, 62668, 62669, 62670, 62677, 62678, 62679, 62680, 62681, 62682, 62683, 62684, 62688, 62695, 62700, 62701, 62705, 62706, 62713, 62714, 62721, 62723, 62730, 62735, 62736, 62737, 62739, 62743, 62744, 62754, 62757, 62767, 62769

LETTUCE
61935, 62004, 62110

LEUKOCYTES
61388, 61429, 61551, 61598, 61601, 61713, 61715, 61803, 61921

LICHENS
61925, 61937, 61973, 61976, 61977, 61991, 62006, 62044, 62057, 62058, 62077, 62121, 62132, 62195

LIDAR
62656

LIFE SPAN
61506

LIGHT-DUTY VEHICLES
61368, 61466, 61558, 61653, 61677, 61705, 61716, 62022, 62086, 62114, 62177, 62230, 62299, 62306, 62307, 62316, 62320, 62323, 62331, 62341, 62348, 62371, 62389, 62407, 62408, 62412, 62427, 62430, 62454, 62495, 62497, 62512, 62537, 62542, 62562, 62605, 62610, 62634, 62640, 62644, 62649, 62659, 62687, 62716, 62717, 62718, 62722, 62728, 62735, 62745, 62746, 62749, 62767, 62795

LILY
62035

LIME KILNS
62201, 62485

LIME/LIMESTONE PROCESSES
62266, 62634

LIMITED ACCESS ROADS
62659

LINE SOURCES
61707, 62618

LIPIDS
61372, 61428, 61510, 61511, 61551, 61633, 61816, 61903

LIQUEFIED PETROLEUM GAS (LPG)
62609

LITIGATION
62433, 62557, 62560, 62625, 62639, 62655, 62660, 62669, 62700, 62701, 62713, 62727, 62756

LIVER
61376, 61377, 61450, 61462, 61463, 61465, 61481, 61507, 61512, 61513, 61529, 61537, 61548, 61556, 61558, 61620 61630, 61654, 61675, 61730, 61755, 61816, 61879, 61838, 61900, 62067, 62156, 62202

LOCAL GOVERNMENTS
61899, 62365, 62416, 62475, 62481, 62618, 62642, 62659, 62687, 62713, 62733, 62736, 62737, 62739, 62741, 62742, 62743, 62744, 62747, 62748, 62750, 62792

LONDON
61464, 61796

LOS ANGELES
61707, 62577, 62650, 62757, 62759

LOUISIANA
62191

LOWER ATMOSPHERE
61495, 62791

LUBRICANTS
62209

LUNG CANCER
61375, 61378, 61409, 61411, 61417, 61448, 61452, 61457, 61474, 61475, 61482, 61518, 61538, 61554, 61586, 61651, 61653, 61684, 61706, 61709, 61712, 61735, 61737, 61739, 61740, 61801, 61804, 61807, 61825, 61873, 61881, 61883, 61905, 61909, 61916, 61919, 62302

LUNG CLEARANCE
61812, 61832, 61880, 61881, 61886, 61889

LUNGS
61360, 61364, 61366, 61370, 61372, 61374, 61376, 61377, 61379, 61380, 61386, 61396, 61433, 61447, 61459, 61460, 61465, 61470, 61478, 61481, 61489, 61496, 61498, 61510, 61519, 61521, 61524, 61529, 61548, 61549, 61579, 61586, 61588, 61597, 61598, 61601, 61617, 61620, 61623, 61633, 61641, 61651, 61652, 61653, 61654, 61655, 61677, 61683, 61684, 61685, 61686, 61687, 61688, 61689, 61694, 61698, 61701, 61702, 61706, 61710, 61715, 61720, 61740, 61741, 61769, 61771, 61782, 61788, 61802, 61810, 61816, 61818, 61820, 61823, 61824, 61825, 61832, 61833, 61835, 61847, 61848, 61856, 61874, 61881, 61884, 61887, 61896, 61900, 61902, 61907, 61910, 61913, 61919, 61924, 62022

LYMPHOCYTES
61756, 61803

M

MACROPHAGES
61379, 61465, 61519, 61617, 61677, 61686, 61687, 61688, 61689, 61706, 61710, 61720, 61741, 61756, 61788, 61823, 61848, 61874

MAGNESIUM COMPOUNDS
61380, 61611, 61653, 61659, 61902, 61984, 62085, 62175

MAINE
62679

MAINTENANCE
61918, 62278, 62388, 62393, 62407, 62412, 62415, 62486, 62495, 62659, 62692, 62717, 62794

MANAGEMENT PERSONNEL
62335, 62458, 62709, 62738

MANGANESE COMPOUNDS
61368, 61376, 61377, 61390, 61658, 61659, 61685, 61686, 61705, 61706, 61707, 61921, 61924, 61953, 62020, 62036, 62037, 62048, 62052, 62080

MANUFACTURING INDUSTRIES
61406, 61419, 61450, 61452, 61467, 61493, 61499, 61514, 61518, 61520, 61531, 61565, 61566, 61567, 61568, 61571, 61582, 61586, 61590, 61591, 61600, 61607, 61655, 61658, 61663, 61730, 61733, 61743, 61755, 61783, 61784, 61793, 61801, 61850, 61870, 61877, 61884, 61901, 61917, 61918, 61922, 61957, 61960, 61961, 61978, 61984, 62006, 62017, 62020, 62036, 62037, 62040, 62041, 62044, 62050, 62054, 62058, 62061, 62062, 62067, 62068, 62075, 62095, 62099, 62123, 62131, 62133, 62143, 62155, 62156, 62161, 62162, 62163, 62168, 62175, 62197, 62198, 62200, 62204, 62205, 62206, 62207, 62220, 62221, 62234, 62239, 62240, 62244, 62256, 62260, 62267, 62268, 62273, 62276, 62277, 62279, 62282, 62289, 62290, 62293, 62352, 62354, 62371, 62377, 62379, 62387, 62403, 62404, 62408, 62434, 62435, 62475, 62485, 62487, 62498, 62500, 62503, 62505, 62508, 62514, 62530, 62532, 62533, 62546, 62549, 62555, 62558, 62560, 62561, 62580, 62584, 62609, 62612, 62624, 62625, 62685, 62686, 62704, 62709, 62714, 62728, 62729, 62755, 62757, 62758, 62760, 62765, 62779, 62797

MAPLE TREES
62024, 62085

MAPPING
61892, 62167

MARKETING
62246, 62266, 62272, 62274

MARYLAND
62533

MASS TRANSPORTATION
62389, 62640, 62655, 62659, 62717

MASSACHUSETTS
62253, 62366, 62527, 62684

MATERIALS HANDLING
62373, 62534, 62550, 62612

MATHEMATICAL ANALYSES
61353, 61397, 61449, 61455, 61536, 61610, 61666, 61732, 61762, 61802, 61841, 61859, 61887, 61892, 61911, 62142, 62205, 62233, 62241, 62243, 62253, 62258, 62263, 62264, 62265, 62274, 62319, 62335, 62366, 62383, 62414, 62462, 62473, 62483, 62510, 62511, 62522, 62526, 62577, 62648, 62662, 62664, 62666, 62667, 62691, 62696, 62711, 62770, 62783, 62784

MATHEMATICAL MODELING
61353, 61397, 61455, 61732, 61802, 61887, 61892, 61911, 62142, 62241, 62243, 62258, 62264, 62265, 62335, 62366, 62414, 62462, 62473, 62483, 62510, 62511, 62522, 62577, 62648, 62662, 62664, 62666, 62667, 62691, 62696, 62711, 62770, 62783

MAXIMUM ALLOWABLE CONCENTRATION
61549, 61600, 61630, 61678, 61682, 61794, 61809, 61866, 61875, 61876, 61893, 61900, 61915, 62292, 62302, 62308, 62317, 62318, 62319, 62325, 62326, 62327, 62328, 62329, 62416, 62419, 62474, 62608, 62696

MEAT PACKING PLANTS
62273

MEAT PRODUCTS INDUSTRY
61520, 62273

MEDICAL PERSONNEL
61505, 61543, 62763

MEETINGS
62373

MEMBRANES
61396, 61423, 61424, 61425, 61428, 61499, 61584, 61588, 61602, 61675, 61677, 61701, 61759, 61788, 61789, 61816, 61853, 62140, 62182

MERCAPTANS
61520, 62211, 62305, 62453, 62627, 62665

MERCURY COMPOUNDS
61367, 61681, 61687, 61688, 61738, 61743, 61765, 61774, 61849, 61865, 61887, 62054, 62181, 62190, 62377, 62379, 62380, 62402, 62788

METABOLISM
61465, 61480, 61484, 61491, 61507, 61510, 61588, 61612, 61633, 61658, 61675, 61677, 61678, 61756, 61790, 61798, 61811, 61816, 61831, 61841, 61843, 61856, 61864, 61865, 61877, 61887, 61904, 61915, 61917, 61926, 62089, 62109, 62318

METAL COMPOUNDS
61352, 61361, 61367, 61368, 61369, 61370, 61376, 61377, 61380, 61381, 61382, 61386, 61390, 61400, 61403, 61405, 61406, 61408, 61417, 61418, 61431, 61432, 61434, 61444, 61446, 61449, 61453, 61459, 61462, 61463, 61466, 61467, 61472, 61473, 61479, 61480, 61481, 61482, 61484, 61485, 61497, 61509, 61524, 61526, 61537, 61540, 61553, 61554, 61556, 61558, 61559, 61569, 61582, 61585, 61586, 61596, 61611, 61614, 61619, 61620, 61630, 61636, 61645, 61652, 61653, 61658, 61659, 61663, 61674, 61681, 61682, 61685, 61686, 61687, 61688, 61689, 61705, 61706, 61707, 61708, 61711, 61714, 61730, 61731, 61736, 61738, 61743, 61760, 61763, 61765, 61767, 61771, 61774, 61777, 61787, 61790, 61793, 61798, 61805, 61810, 61813, 61816, 61840, 61849, 61853, 61854, 61855, 61862, 61865, 61871, 61872, 61875, 61878, 61886, 61887, 61888, 61891, 61899, 61902, 61904, 61905, 61920, 61921, 61922, 61923, 61924, 61947, 61953, 61954, 61960, 61961, 61962, 61984, 61985, 61992, 61999, 62000, 62001, 62012, 62015, 62018, 62020, 62022, 62026, 62036, 62037, 62044, 62047, 62048, 62052, 62053, 62054, 62058, 62060, 62065, 62076, 62078, 62079, 62080, 62082, 62085, 62093, 62097, 62105, 62108, 62110, 62114, 62123, 62136, 62141, 62148, 62156, 62161, 62171, 62175, 62177, 62181, 62184, 62185, 62190, 62191, 62197, 62201, 62202, 62219, 62226, 62230, 62296, 62314, 62318, 62354, 62371, 62377, 62379, 62380, 62396, 62402, 62471, 62472, 62525, 62547, 62561, 62579, 62580, 62611, 62616, 62662, 62718, 62722, 62723, 62788

METAL FABRICATION
61600, 61783, 62131, 62161, 62268, 62277, 62279, 62686, 62755

METAL INDUSTRIES
61406, 61419, 61452, 61467, 61493, 61499, 61518, 61565, 61566, 61571, 61586, 61591, 61658, 61663, 61730, 61733, 61743, 61784, 61793, 61877, 61901, 61922, 61957, 61960, 61961, 61984, 62006, 62020, 62036, 62037, 62040, 62041, 62044, 62058, 62062, 62067, 62068, 62099, 62123, 62133, 62156, 62163, 62197, 62198, 62200, 62204, 62205, 62206, 62207, 62234, 62240, 62244, 62260, 62268, 62276, 62279, 62289, 62293, 62377, 62403, 62404, 62408, 62500, 62503, 62514, 62532, 62549, 62558, 62561, 62580, 62624, 62625, 62704, 62709, 62728, 62729, 62760, 62779, 62797

METAL POISONING
61352, 61367, 61403, 61441, 61446, 61449, 61453, 61462, 61472, 61484, 61485, 61559, 61596, 61659, 61682, 61685, 61689, 61711, 61738, 61813, 61853, 61865, 61891, 61899, 61904, 61922, 62022, 62114, 62136, 62202, 62788

METALS
61877, 61922, 62156, 62200, 62204, 62208, 62210, 62224, 62226, 62228, 62229, 62231, 62276, 62277, 62279, 62709, 62729, 62756, 62790

METEOROLOGICAL INSTRUMENTS
62365

METEOROLOGY
61394, 61439, 61467, 61521, 61550, 61575, 61621, 61719, 61733, 61754, 61796, 61843, 61845, 61890, 61905, 61923, 61948, 61982, 62003, 62034, 62055, 62058, 62062, 62065, 62147, 62150, 62171, 62178, 62200, 62208, 62210, 62214, 62219, 62223, 62225, 62227, 62229, 62280, 62334, 62335, 62341, 62351, 62414, 62416, 62424, 62431, 62452, 62513, 62577, 62583, 62590, 62612, 62637, 62638, 62656, 62657, 62672, 62696, 62712, 62720, 62724, 62728, 62755, 62763, 62788, 62791

METHANES
61447, 62424, 62637, 62653, 62665

METHYL MERCAPTANS
61520, 62305, 62453, 62627

METHYL SULFIDE
62211, 62305, 62453, 62627

METROPOLITAN AREAS
61356, 61375, 61382, 61383, 61389, 61391, 61392, 61393, 61400, 61402, 61406, 61408, 61409, 61411, 61416, 61418, 61421, 61443, 61444, 61445, 61446, 61448, 61455, 61457, 61468, 61475, 61488, 61504, 61509, 61514, 61515, 61524, 61525, 61526, 61533, 61538, 61543, 61547, 61557, 61564, 61569, 61570, 61572, 61573, 61581, 61582, 61583, 61584, 61597, 61605, 61607, 61608, 61619, 61623, 61624, 61627, 61631, 61642, 61649, 61651, 61652, 61653, 61656, 61658, 61660, 61661, 61662, 61669, 61670, 61676, 61693, 61698, 61699, 61707, 61709, 61712, 61714, 61717, 61719, 61722, 61726, 61727, 61728, 61729, 61733, 61734, 61735, 61737, 61738, 61757, 61763, 61776, 61795, 61805, 61806, 61808, 61811, 61814, 61825, 61845, 61854, 61858, 61860, 61861, 61871, 61877, 61878, 61889, 61890, 61895, 61909, 61914, 61920, 61925, 61932, 61933, 61936, 61937, 61956, 61965, 61973, 61993, 61997, 61998, 62022, 62027, 62031, 62038, 62043, 62047, 62057, 62058, 62059, 62071, 62077, 62080, 62081, 62098, 62111, 62122, 62124, 62125, 62132, 62141, 62152, 62159, 62167, 62184, 62191, 62199, 62210, 62212, 62213, 62222, 62225, 62236, 62253, 62275, 62281, 62312, 62320, 62340, 62341, 62355, 62368, 62369, 62372, 62374, 62383, 62388, 62389, 62391, 62405, 62417, 62418, 62424, 62437, 62447, 62452, 62476, 62484, 62517, 62518, 62525, 62527, 62537, 62538, 62542, 62573, 62576, 62577, 62579, 62586, 62606, 62615, 62626, 62637, 62640, 62644, 62653, 62659, 62662, 62667, 62670, 62671, 62672, 62686, 62690, 62691, 62703, 62708, 62711, 62712, 62717, 62718, 62722, 62728, 62736, 62739, 62743, 62748, 62755, 62757, 62767, 62776, 62779, 62783, 62788, 62797

MEXICO
61617, 62662, 62690, 62713

MICE
61388, 61417, 61423, 61424, 61428, 61432, 61433, 61457, 61471, 61478, 61480, 61489, 61497, 61529, 61537, 61541, 61548, 61551, 61577, 61598, 61601, 61602, 61612, 61630, 61632, 61680, 61701, 61706, 61710, 61713, 61715, 61731, 61781, 61782, 61803, 61823, 61901, 61910, 61913, 61923

MICHIGAN
62593

MICROMETEOROLOGY
61905, 62728

MICROORGANISMS
61386, 61471, 61478, 61527, 61563, 61637, 61684, 61705, 61756, 61770, 61791, 61792, 61870, 61872, 61874, 61905, 61964, 62065, 62080, 62115, 62135, 62166, 62203, 62206, 62216, 62219, 62657

MICROSCOPY
61451, 62169

MIDDLE ATMOSPHERE
61495

MINERAL PROCESSING
61451, 61865, 61868, 62082, 62282, 62322, 62704, 62760

MINING
61361, 61483, 61743, 61765, 61865, 61902, 61984, 62112, 62155, 62232, 62239, 62534, 62555, 62580, 62585, 62647

MINNESOTA
62596

MISSISSIPPI
62594

MISSOURI
61361, 61707, 62424, 62452, 62580, 62604, 62637, 62743

MISTS
61364, 61384, 61523, 61702, 61797, 62085, 62508

MITOCHONDRIA
61513, 62126, 62151

MOLYBDENUM COMPOUNDS
61484, 61582, 61921, 62018

MONITORING
61707, 61708, 61892, 61939, 62196, 62242, 62279, 62289, 62291, 62295, 62313, 62322, 62334, 62351, 62358, 62365, 62370, 62381, 62382, 62396, 62401, 62405, 62421, 62424, 62431, 62435, 62436, 62450, 62451, 62464, 62471, 62475, 62479, 62487, 62506, 62513, 62515, 62525, 62530, 62568, 62572, 62583, 62597, 62608, 62653, 62657, 62664, 62665, 62690, 62694, 62708, 62712, 62715, 62717, 62719, 62721

MONTANA
62404, 62503

MONTHLY
61488, 61890, 61897, 62081

MORBIDITY
61349, 61375, 61387, 61391, 61394, 61398, 61416, 61421, 61442, 61443, 61445, 61468, 61493, 61504, 61506, 61508, 61514, 61515, 61516, 61522, 61534, 61546, 61547, 61557, 61578, 61580, 61581, 61582, 61591, 61597, 61605, 61607, 61616, 61624, 61625, 61631, 61638, 61649, 61655, 61656, 61662, 61664, 61670, 61721, 61722, 61727, 61728, 61729, 61735, 61737, 61739, 61777, 61795, 61806, 61825, 61827, 61845, 61868, 61881, 61883, 61890, 61897, 61910, 61914, 62154, 62396, 62670

MORTALITY
61375, 61397, 61398, 61409, 61411, 61447, 61448, 61452, 61457, 61468, 61487, 61506, 61508, 61538, 61555, 61556, 61567, 61581, 61616, 61618, 61684, 61709, 61731, 61737, 61744, 61748, 61749, 61768, 61804, 61815, 61825, 61837, 61852, 61859, 61873, 61899, 61901, 61909, 61910, 61913, 61923, 62154, 62396, 62739

MOSSES
61925, 61953, 61973, 61976, 61977, 61991, 62020, 62077

MOTORCYCLES
62348, 62497, 62649

MOTTLING
62059, 62071

MOUNTAINS
61770, 62728

MULBERRIES
61954, 62011, 62014, 62017, 62018, 62056, 62082, 62092, 62095, 62102, 62116, 62134, 62145, 62163, 62185, 62186, 62187, 62188, 62189, 62194, 62197

MULTIPLE-SOURCE STACKS
62783

MUNICIPAL INCINERATORS
62358, 62489

MUSCLES
61481, 61512, 61549, 61568, 61639, 61843

MUTAGENESIS
61627, 61684, 61964

N

NAILS (ANATOMY)
61738

NATIONAL AIR SAMPLING NETWORK (NASN)
62515

NATIONAL GOVERNMENTS
61849, 61899, 62262, 62269, 62300, 62323, 62324, 62352, 62365, 62377, 62380, 62385, 62394, 62399, 62416, 62431, 62438, 62441, 62442, 62449, 62460, 62461, 62464, 62528, 62565, 62605, 62619, 62630, 62633, 62634, 62650, 62668, 62687, 62688, 62701, 62705, 62713, 62714, 62716, 62719, 62721, 62726, 62730, 62731, 62732, 62733, 62734, 62735, 62736, 62737, 62739, 62740, 62742, 62744, 62746, 62747, 62748, 62750, 62752, 62753, 62754, 62769, 62792

NATURAL GAS
62211, 62257, 62466, 62467, 62468, 62585

NAUSEA
61499, 61520, 61828, 61845

NEBRASKA
61446, 62551, 62677

NECROSIS
61950, 61972, 61978, 61987, 62021, 62056, 62059, 62117, 62125, 62143, 62146, 62159

NEEDLES
61927, 61952, 61995, 62021, 62056, 62069, 62143, 62158

NERVOUS SYSTEM
61352, 61388, 61396, 61432, 61447, 61453, 61517, 61531, 61548, 61549, 61568, 61580, 61645, 61658, 61680, 61683, 61696, 61731, 61747, 61755, 61775, 61782, 61790, 61844, 61853, 61866, 61876, 61879, 61882, 61885, 61887, 61893, 61899, 61904, 61912, 61915, 61918, 61922, 61926, 62325

NETHERLANDS
61476, 61751, 61766, 62270, 62352, 62401, 62431, 62665, 62713, 62770, 62781

NETWORKS
62401, 62431, 62476, 62565, 62581, 62583, 62656, 62662, 62694

NEVADA
62177, 62376, 62395, 62595

NEW HAMPSHIRE
62589

NEW JERSEY
62056, 62284, 62451, 62559, 62678

NEW MEXICO
62549, 62680, 62690

NEW YORK CITY
61733, 61854, 62644, 62717, 62775, 62777

NEW YORK STATE
61733, 61854, 62275, 62407, 62445, 62446, 62484, 62495, 62644, 62717, 62775, 62777

NEW ZEALAND
61614, 61991, 62340, 62374, 62763

NICKEL
62226, 62229

NICKEL ALLOYS
62226

NICKEL COMPOUNDS
61380, 61381, 61417, 61482, 61497, 61582, 61636, 61652, 61653, 61685, 61686, 61687, 61688, 61736, 61777, 61790, 61905, 61921, 61953, 62047, 62048, 62076, 62110

NICOTINES
61680, 61799

NITRATES
61491, 61523, 61575, 61627, 61872, 61935, 61997, 61998, 62008, 62045, 62059, 62063, 62128, 62136, 62139, 62146, 62152, 62153, 62183, 62190, 62396, 62637

NITRIC ACID
61718, 62281, 62322

NITRIC ACID PLANTS
62377, 62487, 62555

NITRIC ANHYDRIDE (N2O5)
62328

NITRIC OXIDE (NO)
61385, 61396, 61439, 61454, 61521, 61522, 61548, 61555, 61598, 61601, 61602, 61669, 61715, 61760, 61782, 61823, 61846, 62153, 62295, 62309, 62328, 62401, 62482, 62513, 62568, 62577, 62628, 62665, 62712

NITRILES
62209

NITRITES
61371, 62200

NITROGEN
61447, 62012, 62084, 62143, 62174, 62198, 62200

NITROGEN DIOXIDE (NO2)
61374, 61381, 61386, 61396, 61399, 61412, 61429, 61439, 61447, 61458, 61471, 61492, 61501, 61502, 61521, 61535, 61536, 61601, 61602, 61633, 61634, 61649, 61664, 61669, 61672, 61703, 61710, 61719, 61744, 61756, 61760, 61776, 61811, 61823, 61835, 61846, 61855, 61900, 61910, 61913, 61939, 62002, 62014, 62028, 62035, 62063, 62153, 62183, 62208, 62214, 62295, 62309, 62316, 62328, 62347, 62396, 62401, 62424, 62482, 62484, 62494, 62513, 62568, 62577, 62587, 62588, 62626, 62628, 62665, 62692, 62712, 62723, 62726, 62759, 62781

NITROGEN ORGANIC COMPOUNDS
61577, 61594, 61627, 61680, 61736, 61799, 62209, 62221, 62327, 62398, 62627

NITROGEN OXIDES
61353, 61374, 61381, 61385, 61386, 61389, 61390, 61396, 61399, 61404, 61412, 61429, 61438, 61439, 61447, 61454, 61458, 61471, 61488, 61492, 61501, 61502, 61521, 61522, 61528, 61534, 61535, 61536, 61539, 61548, 61555, 61562, 61565, 61566, 61578, 61582, 61583, 61598, 61601, 61602, 61605, 61626, 61627, 61633, 61634, 61647, 61649, 61664, 61669, 61672, 61703, 61710, 61715, 61718, 61719, 61736, 61744, 61754, 61756, 61760, 61764, 61776, 61782, 61811, 61823, 61829, 61835, 61845, 61846, 61851, 61855, 61863, 61894, 61900, 61910, 61913, 61939, 61960, 61991, 62002, 62014, 62028, 62035, 62053, 62063, 62097, 62139, 62146, 62153, 62183, 62190, 62208, 62214, 62229, 62252, 62282, 62287, 62291, 62295, 62299, 62301, 62306, 62307, 62309, 62314, 62316, 62320, 62322, 62328, 62331, 62339, 62340, 62347, 62353, 62381, 62383, 62396, 62401, 62421, 62424, 62428, 62430, 62431, 62454, 62472, 62482, 62484, 62494, 62497, 62506, 62510, 62513, 62518, 62520, 62526, 62537, 62562, 62565, 62568, 62577, 62584, 62586, 62587, 62588, 62599, 62605, 62610, 62611, 62624, 62626, 62628, 62629, 62634, 62637, 62638, 62665, 62687, 62692, 62702, 62712, 62717, 62722, 62723, 62726, 62759, 62781

NITROGEN TRIOXIDE (NO3)
62328

NITROGENOUS FERTILIZER PLANTS
62143, 62377, 62487, 62555

NITROSO
62200

NITROUS ANHYDRIDE (N2O3)
61846

NITROUS OXIDE (N2O)
61447, 61823, 62424

NON-METHANE HYDROCARBONS
62340

NON-METROPOLITAN AREAS
61399, 61408, 61411, 61457, 61506, 61563, 61623, 61627, 61668, 61670, 61676, 61709, 61719, 61737, 61743, 61798, 61801, 61825, 61871, 61878, 61889, 61909, 61990, 62062, 62071, 62075, 62077, 62079, 62080, 62098, 62160, 62167, 62202, 62204, 62207, 62210, 62273, 62341, 62376, 62484, 62586, 62607, 62609, 62722, 62751, 62779, 62783

NON-RESIDENTIAL OPERATIONS
62376

NON-SMOKERS
61356, 61455, 61457, 61532, 61545, 61613, 61622, 61644, 61695, 61779, 61796, 61814, 61817, 61860, 61914, 61920

NORTH CAROLINA
62491

NORTH DAKOTA
62600

NORWAY
61499, 62006, 62212

NOSE
61423, 61424, 61425, 61427, 61432, 61673, 61701, 61833, 61879

NOX CONTROL
62235, 62252, 62267

NUCLEAR EXPLOSIONS
62148

NUCLEAR POWER PLANTS
62636

NUCLEIC ACIDS
61368, 61480, 61645, 61685, 61689, 61706, 61710, 61800, 61816, 62179

NUCLEOTIDES
61926

NUTRIENTS
61428, 61482, 61489, 61710, 62085

NYLON
62229

O

OAK TREES
62056, 62093

OATS
61951

OCEANS
62210, 62219, 62223, 62228, 62728

ODOR CONTROL
62651, 62718

ODOR COUNTERACTION
62718

ODORIMETRY
61822, 62304, 62660, 62766, 62770

ODOROUS POLLUTANTS
61426, 61520, 61693, 61778, 61822, 61850, 61866, 61876, 61900, 62236, 62273, 62304, 62308, 62329, 62331, 62355, 62382, 62417, 62429, 62448, 62453, 62524, 62538, 62606, 62609, 62627, 62660, 62669, 62686, 62727, 62765, 62766, 62770, 62779

OHIO
62674

OKLAHOMA
62572, 62683

OLEFINS
61447, 61627, 61841, 61935, 61939, 61949, 62028, 62116, 62153, 62176, 62179, 62181, 62190, 62211, 62665

OLFACTION
61778

ONIONS
61982, 61997, 62041, 62100, 62103

OPACITY METERS
62291, 62545, 62546

OPEN BURNING
62280, 62375, 62395, 62555, 62757

OPERATING COSTS
62238, 62240, 62247, 62248, 62283

OPERATING CRITERIA
62313, 62334, 62449, 62689, 62749

OPERATING VARIABLES
61646, 62241, 62315, 62358, 62367, 62370, 62464, 62515, 62645

OPINION SURVEYS
61407, 62236, 62356, 62538, 62636, 62760, 62765, 62766, 62767, 62768, 62769, 62775, 62779

OPTICAL METHODS
61451, 62169

ORANGES
62088

ORCHARD HEATERS (FROST CONTROL)
62375

ORCHARDS
62073

OREGON
62280, 62485, 62544, 62553

ORGANIC ACIDS
61447, 61630, 61760, 61774, 61876, 61900, 62157, 62179, 62525

ORGANIC WASTES
61792, 62345

ORGANOMETALLICS
61865

ORNAMENTALS
62046

OSAKA
61421, 61506, 61660, 61666, 61684, 62083, 62615, 62626

OUTPATIENT VISITS
61505

OXIDANT PRECURSORS
62383, 62510, 62586

OXIDANTS
61351, 61353, 61388, 61439, 61522, 61523, 61536, 61550, 61551, 61562, 61574, 61575, 61624, 61625, 61626, 61634, 61713, 61718, 61720, 61724, 61750, 61803, 61808, 61845, 61851, 61894, 61929, 61930, 61932, 61941, 61945, 61946, 61948, 61963, 61981, 61991, 61996, 61997, 61998, 62007, 62009, 62010, 62011, 62025, 62033, 62042, 62059, 62063, 62071, 62081, 62097, 62100, 62103, 62117, 62128, 62139, 62144, 62159, 62164, 62190, 62312, 62316, 62340, 62383, 62388, 62396, 62407, 62431, 62451, 62459, 62484, 62510, 62511, 62512, 62513, 62518, 62559, 62583, 62584, 62586, 62606, 62608, 62626, 62628, 62649, 62686, 62692, 62712, 62717, 62723, 62726, 62759

OXIDATION
61458, 61983, 62157, 62200

OXYGEN
61454, 61469, 61611, 61647, 61831, 61906, 62291, 62506

OXYGEN CONSUMPTION
61855, 61880

OXYGEN DIFFUSION
61835, 61881

OZONE
61360, 61363, 61364, 61366, 61371, 61372, 61373, 61379, 61381, 61386, 61388, 61389, 61390, 61413, 61423, 61424, 61425, 61428, 61429, 61438, 61447, 61470, 61489, 61494, 61500, 61501, 61502, 61510, 61511, 61519, 61521, 61528, 61532, 61535, 61551, 61562, 61574, 61593, 61606, 61627, 61633, 61646, 61650, 61672, 61697, 61703, 61710, 61713, 61718, 61720, 61736, 61754, 61756, 61757, 61803, 61811, 61900, 61935, 61939, 61944, 61955, 61959, 61963, 61969, 61981, 61982, 61988, 61991, 61998, 62002, 62003, 62008, 62014, 62015, 62023, 62028, 62029, 62030, 62033, 62034, 62035, 62046, 62059, 62063, 62106, 62109, 62115, 62117, 62126, 62127, 62128, 62139, 62144, 62146, 62147, 62149, 62152, 62153, 62170, 62173, 62176, 62180, 62183, 62190, 62208, 62214, 62295, 62312, 62401, 62421, 62424, 62568, 62577, 62637, 62656, 62665, 62764, 62781

P

PACKED TOWERS
62279

PAINTS
61853, 62202, 62208, 62214, 62227, 62229, 62282

PAPER
61869

PAPER AND ALLIED MANUFACTURING
61978, 62267, 62475, 62485, 62704, 62714, 62765

PAPER CHROMATOGRAPHY
61917

PAPER MILLS
62714

PARAMECIA
61383

PARIS
61920, 62022, 62706

PARKING FACILITIES
62376, 62484, 62644, 62655

PARTICLE COUNTING
61451, 61474

PARTICLE INVESTIGATION METHODS
61451, 61474

PARTICLE SHAPE
61788, 61907

PARTICLE SIZE
61369, 61370, 61451, 61461, 61617, 61746, 61810, 61818, 61824, 61832, 61833, 61861, 61884, 61898, 61907, 61953, 62367, 62696

PARTICLE SIZE DISTRIBUTION
61466, 61797

PARTICULATE SAMPLING
62313, 62722

PASSIVE SMOKING
61455, 61760, 61814, 61844

PATHOLOGICAL TECHNIQUES
61429, 61602, 61741, 61761, 61771, 61782, 61855, 61863, 61924

PAVING AND ROOFING MATERIALS PRODUCTION
61801, 62377, 62379, 62546

PEANUTS
61959, 62092, 62103

PEARS
62004, 62073, 62101, 62178, 62192

PEAS
61951, 61985, 62003, 62004, 62151

PENNSYLVANIA
62258, 62284, 62499, 62532, 62602

PENTANES
61866

PEPPERS
61951

PERFORMANCE STANDARDS
61534, 61536, 61767, 61884, 62235, 62237, 62257, 62272, 62287, 62289, 62290, 62291, 62293, 62299, 62300, 62301, 62305, 62306, 62307, 62309, 62310, 62311, 62314, 62315, 62320, 62322, 62323, 62324, 62331, 62332, 62334, 62337, 62339, 62342, 62344, 62347, 62348, 62353, 62358, 62360, 62363, 62371, 62377, 62379, 62380, 62381, 62382, 62385, 62393, 62394, 62395, 62417, 62420, 62430, 62433, 62435, 62440, 62441, 62442, 62443, 62444, 62445, 62446, 62453, 62472, 62487, 62497, 62498, 62500, 62502, 62507, 62508, 62509, 62512, 62520, 62521, 62523, 62526, 62532, 62533, 62537, 62542, 62545, 62546, 62549, 62551, 62553, 62555, 62556, 62558, 62560, 62561, 62562, 62578, 62580, 62584, 62585, 62587, 62588, 62589, 62591, 62592, 62593, 62594, 62595, 62596, 62597, 62605, 62607, 62608, 62609, 62610, 62611, 62613, 62614, 62623, 62624, 62628, 62634, 62649, 62675, 62676, 62688, 62696, 62710, 62715, 62716, 62730, 62732, 62733, 62746, 62750, 62782

PERMEABILITY
61461, 61774, 61833, 62149

PERMITS
62402, 62434, 62481, 62533, 62714

PEROXIDES
62231, 62309

PEROXYACETYL NITRATE
61491, 61523, 61627, 61997, 61998, 62008, 62045, 62059, 62063, 62139, 62146, 62152, 62183, 62190

PEROXYACYL NITRATES
61491, 61523, 61627, 61935, 61997, 61998, 62008, 62045, 62059, 62063, 62128, 62139, 62146, 62152, 62153, 62183, 62190

PEROXYPROPYL NITRATE
62045

PERSONNEL
61358, 61505, 61543, 61564, 61592, 61719, 62242, 62262, 62271, 62278, 62335, 62338, 62343, 62358, 62365, 62381, 62382, 62423, 62435, 62448, 62449, 62450, 62458, 62463, 62464, 62475, 62479, 62515, 62517, 62577, 62618, 62644, 62686, 62709, 62721, 62724, 62738, 62748, 62763, 62769, 62778, 62785

PERSONNEL QUALIFICATIONS
62463, 62738, 62769

PERYLENES
62051

PESTICIDES
61441, 61481, 61517, 61736, 61872, 61926, 62185, 62186, 62187, 62349, 62398

PETROLEUM AND COAL PRODUCTS INDUSTRY
61565, 61755, 61801, 61901, 62075, 62155, 62220, 62221, 62239, 62282, 62290, 62352, 62371, 62377, 62379, 62387, 62434, 62487, 62546, 62612, 62704, 62757, 62758, 62779

PETROLEUM DISTRIBUTION
62757

PETROLEUM PRODUCTION
62155, 62239, 62534, 62555

PETROLEUM REFINING
61755, 61901, 62075, 62155, 62221, 62239, 62282, 62371, 62377, 62387, 62434, 62487, 62612, 62757, 62758, 62779

PETUNIA
61930, 61932, 62045, 62081

PH
61363, 61574, 61936, 61979, 61983, 61996, 62055, 62085, 62200, 62203, 62225, 62791

PHARYNX
61415, 61527, 61584, 61586, 61844

PHENOLS
61447, 61549, 61627, 61730, 61755, 61760, 61900, 62166, 62209, 62226

PHILADELPHIA
62258, 62499

PHOSPHATIC FERTILIZER PLANTS
61419, 61590, 62061, 62062

PHOSPHINE
62525

PHOSPHORUS COMPOUNDS
61774, 62174, 62198, 62525, 62547

PHOSPHORUS ORGANIC COMPOUNDS
61517, 62398

PHOTOCHEMICAL REACTIONS
61707, 61718, 61845, 62430, 62510, 62577

PHOTOGRAPHIC METHODS
61993, 62043, 62086

PHOTOMETRIC METHODS
62091, 62291, 62545, 62546, 62656

PHOTOOXIDATION
61707

PHOTOSYNTHESIS
61944, 61945, 61955, 61958, 61959, 61966, 61968, 61970, 61971, 61976, 62013, 62053, 62086, 62106, 62107, 62126, 62155, 62165, 62182, 62193, 62199, 62205

PHYSICAL METHODS
62787

PHYTOTOXICANTS
61773, 61926, 62109, 62135, 62138

PIGMENT SYSTEMS
62142

PIGMENTS
61585

PILOT PLANTS
62367

PINE TREES
61783, 61936, 61952, 61966, 61968, 61974, 61975, 61976, 61994, 61995, 62011, 62019, 62021, 62023, 62056, 62060, 62061, 62069, 62080, 62143, 62148, 62158, 62168, 62169

PINTO BEANS
62085, 62126, 62180

PIPELINES
62211

PLAINS
61770

PLANNING AND ZONING
61516, 62152, 62271, 62288, 62297, 62335, 62347, 62364, 62368, 62369, 62374, 62386, 62388, 62389, 62391, 62400, 62414, 62418, 62425, 62434, 62456, 62462, 62465, 62473, 62483, 62510, 62511, 62513, 62520, 62554, 62573, 62576, 62632, 62636, 62640, 62642, 62644, 62651, 62655, 62658, 62659, 62661, 62666, 62667, 62668, 62671, 62695, 62699, 62727, 62728, 62751, 62770, 62774

PLANT DAMAGE
61495, 61655, 61783, 61820, 61901, 61928, 61930, 61931, 61932, 61933, 61934, 61935, 61938, 61939, 61940, 61941, 61946, 61948, 61949, 61950, 61951, 61956, 61957, 61958, 61959, 61960, 61961, 61963, 61968, 61969, 61972, 61973, 61974, 61976, 61978, 61979, 61980, 61981, 61982, 61983, 61987, 61988, 61992, 61993, 61997, 61998, 62002, 62003, 62004, 62006, 62007, 62008, 62010, 62011, 62012, 62014, 62021, 62025, 62026, 62027, 62028, 62029, 62030, 62032, 62033, 62034, 62041, 62042, 62044, 62045, 62046, 62049, 62053, 62056, 62059, 62061, 62063, 62068, 62069, 62071, 62074, 62076, 62077, 62079, 62081, 62085, 62089, 62090, 62091, 62092, 62093, 62094, 62097, 62098, 62099, 62100, 62102, 62103, 62106, 62108, 62110, 62111, 62112, 62113, 62117, 62118, 62123, 62125, 62127, 62129, 62130, 62131, 62132, 62137, 62138, 62139, 62143, 62144, 62146, 62149, 62153, 62155, 62157, 62158, 62159, 62160, 62161, 62164, 62165, 62170, 62173, 62175, 62176, 62178, 62179, 62181, 62183, 62185, 62188, 62189, 62190, 62193, 62198, 62199, 62201, 62204, 62205, 62206, 62207, 62282, 62329, 62538, 62582, 62771, 62779, 62791

PLANT GROWTH AND DEVELOPMENT
61926, 61929, 61938, 61944, 61945, 61948, 61951, 61955, 61956, 61957, 61958, 61959, 61966, 61968, 61970, 61971, 61975, 61976, 61978, 61980, 61982, 61986, 61992, 61993, 61995, 62004, 62007, 62009, 62011, 62013, 62015, 62016, 62019, 62023, 62025, 62030, 62032, 62035, 62039, 62041, 62043, 62050, 62052, 62053, 62071, 62073, 62074, 62075, 62076, 62077, 62083, 62085, 62086, 62098, 62106, 62107, 62108, 62116, 62118, 62126, 62135, 62136, 62139, 62142, 62147, 62153, 62155, 62159, 62160, 62165, 62166, 62168, 62175, 62179, 62180, 62181, 62182, 62193, 62195, 62199, 62201, 62205, 62207

PLANT INDICATORS
61925, 61931, 61936, 61937, 61939, 61952, 61953, 61963, 61965, 61967, 61974, 61976, 61979, 61994, 61997, 61998, 62000, 62005, 62008, 62010, 62020, 62025, 62027, 62035, 62036, 62040, 62053, 62054, 62057, 62061, 62063, 62071, 62072, 62075, 62077, 62087, 62088, 62093, 62098, 62100, 62104, 62121, 62122, 62128, 62129, 62131, 62152, 62155, 62165, 62167, 62168, 62191, 62781

PLANT PROTECTION
62375

PLANT REPRODUCTION
61963, 62009, 62011, 62024, 62085, 62113, 62136, 62142, 62155, 62192

PLASTICS
61869, 61893, 62211

PLASTICS MATERIALS AND SYNTHETIC PLANTS
61450, 61567

PLASTICS PRODUCTION
61531

PLATING AND POLISHING
61783, 62161, 62686

PLATINUM COMPOUNDS
61368, 61558, 61559, 61685, 61689, 61706, 61707, 61708

PLUME BEHAVIOR
62791, 62797

PNEUMOCONIOSIS
61451, 61474, 61484, 61563, 61742, 61797, 61818, 61881, 61884, 61902

PNEUMONIA
61350, 61475, 61488, 61506, 61514, 61528, 61581, 61658, 61701, 61716, 61815, 61817, 61924

POINT SOURCES
62006, 62555, 62561, 62618

POLAND
61829, 61838, 61839, 61843, 61863, 61864, 62143, 62154, 62210, 62245

POLAR REGIONS
62656

POLLEN COLLECTORS
61770

POLLENS
61533, 61637, 62070, 62113

POLLUTANT PRECURSORS
61608, 62383, 62510, 62586

POLYNUCLEAR COMPOUNDS
61359, 61378, 61381, 61383, 61417, 61455, 61457, 61465, 61482, 61487, 61496, 61499, 61518, 61529, 61552, 61612, 61616, 61627, 61684, 61709, 61736, 61760, 61856, 61860, 61861, 61883, 61920, 61964, 61986, 62051, 62302, 62336, 62354, 62396, 62398, 62653

POPULATION
61732, 61749, 61751, 61762, 62058, 62288, 62666, 62765

POPULATION DENSITY
62058

PORTUGAL
61498, 61736

POTASSIUM COMPOUNDS
61953, 62085

POTATOES (SWEET)
62004

POULTRY
61496

POWDERY MILDEWS (ERYSIPHACEAE)
62059

PRECIPITATION
61550, 62003, 62055, 62150, 62171, 62210, 62219, 62225, 62590, 62656, 62791

PREGNANCY
61361, 61426, 61496, 61731, 61852

PRESSURE (ATMOSPHERIC)
61843

PRIMARY SCHOOL STUDENTS
61719

PRIMARY SMELTING AND REFINING OF NONFERR
61406, 61419, 61452, 61467, 61499, 61518, 61733, 61743, 61957, 61960, 61961, 61984, 62020, 62044, 62099, 62123, 62133, 62197, 62234, 62240, 62289, 62293, 62403, 62404, 62503, 62532, 62549, 62580, 62625

PRIMATES (NON-HUMAN)
61470, 61734, 61810, 61855, 61878, 61891, 61908

PRINTING AND PUBLISHING
61493, 61870

PROCESS MODIFICATION
62218, 62234, 62252, 62256, 62704, 62737, 62783, 62794

PROPANES
61447, 62665

PROPENES
62665

PROPOSALS
62293, 62310, 62322, 62402, 62490, 62505, 62509, 62516, 62577, 62717, 62730, 62746

PROTEINS
61365, 61382, 61400, 61418, 61429, 61434, 61453, 61462, 61481, 61489, 61513, 61549, 61645, 61650, 61672, 61685, 61689, 61706, 61710, 61714, 61720, 61730, 61756, 61774, 61790, 61793, 61798, 61800, 61805, 61816, 61878, 61896, 61904, 62072, 62089, 62151, 62173, 62179, 62198

PSYCHOLOGICAL FACTORS
61476, 61587, 61604, 61622, 61690, 61693, 61828, 61842, 61850, 62765

PUBLIC AFFAIRS
61407, 61488, 61525, 61564, 61582, 61585, 61591, 61599, 61604, 61845, 62236, 62299, 62329, 62343, 62356, 62369, 62417, 62422, 62434, 62437, 62448, 62451, 62454, 62455, 62459, 62476, 62477, 62516, 62517, 62518, 62538, 62579, 62606, 62609, 62622, 62630, 62633, 62634, 62636, 62685, 62686, 62693, 62695, 62698, 62700, 62702, 62745, 62748, 62760, 62761, 62763, 62765, 62766, 62767, 62768, 62769, 62770, 62771, 62772, 62775, 62776, 62778, 62779, 62795, 62796

PUBLIC BUILDINGS
62222

PUBLIC INFORMATION
62369, 62422, 62434, 62437, 62451, 62454, 62459, 62476, 62477, 62517, 62518, 62579, 62622, 62630, 62695, 62698, 62745, 62748, 62776, 62778

PULMONARY EDEMA
61654, 62328

PULMONARY FUNCTION
61350, 61366, 61374, 61421, 61436, 61437, 61442, 61456, 61461, 61501, 61502, 61525, 61528, 61532, 61539, 61572, 61582, 61583, 61603, 61647, 61649, 61660, 61666, 61667, 61671, 61695, 61700, 61702, 61710, 61729, 61733, 61734, 61754, 61764, 61766, 61767, 61769, 61776, 61810, 61820, 61825, 61835, 61868, 61880, 61881, 61884, 61887, 61889, 61901

PULMONARY RESISTANCE
61532, 61572, 61660, 61702, 61734, 61810, 61835, 61901

PULP MILLS
61978, 62267, 62475, 62485, 62714, 62765

PULSE RATE
61476, 61491, 61702, 61826, 61882

PYRENES
61378, 61381, 61383, 61417, 61455, 61465, 61487, 61496, 61518, 61529, 61552, 61612, 61616, 61684, 61709, 61736, 61760, 61860, 61861, 61883, 61920, 61986, 62051, 62302, 62336, 62354, 62396

PYRIDINES
61594

PYROLYSIS
61541

Q

QUALITY ASSURANCE
62370, 62479, 62568, 62645, 62694

QUESTIONNAIRES
61493, 61599, 61749, 61752, 61845, 61877, 62236, 62280, 62284, 62437, 62535, 62606, 62636, 62769

QUINOLINES
61736

R

RABBITS
61366, 61371, 61373, 61379, 61413, 61428, 61434, 61454, 61513, 61519, 61540, 61606, 61630, 61633, 61650, 61677, 61686, 61687, 61688, 61689, 61710, 61718, 61720, 61750, 61755, 61775, 61807, 61835, 61838, 61839, 61844, 61852, 61885, 61901, 61923, 61924

RADIOACTIVE RADIATION
61404, 61466, 61482, 61636, 61853, 61888, 62298, 62312, 62318, 62720

RADIOACTIVE TRACERS
61579, 61898, 62174

RADIOGRAPHY
61868, 61877, 61881, 62169

RADIOLOGICAL HEALTH
61764

RADISHES
61997, 61999, 62004, 62045, 62103

RAIN
61550, 62003, 62055, 62150, 62171, 62219, 62225, 62791

RANKINE CYCLE ENGINES
62634

RAPE
61958

RATS
61352, 61357, 61360, 61362, 61364, 61368, 61370, 61372, 61374, 61377, 61378, 61381, 61413, 61429, 61438, 61450, 61459, 61462, 61463, 61469, 61477, 61507, 61510, 61511, 61512, 61513, 61518, 61537, 61549, 61554, 61555, 61556, 61558, 61559, 61577, 61588, 61593, 61620, 61630, 61639, 61648, 61654, 61672, 61677, 61702, 61703, 61706, 61730, 61741, 61757, 61761, 61785, 61790, 61799, 61809, 61810, 61819, 61837, 61843, 61847, 61866, 61878, 61879, 61882, 61886, 61887, 61923, 62302

REACTION KINETICS
61507, 61841, 61887, 62180, 62225, 62231, 62577

REACTION MECHANISMS
61462, 61675, 61983, 62157, 62231, 62426

REAL PROPERTY OPERATIONS
62271, 62376

RECORDING METHODS
61993, 62043, 62086

RECREATION AREAS
62079, 62080, 62098, 62160, 62376

REDUCTION
61458, 61788

REFUSE SYSTEMS
61792, 61869, 62278, 62313, 62322, 62333, 62344, 62345, 62358, 62377, 62379, 62382, 62420, 62470, 62489, 62499, 62535, 62612, 62704, 62725, 62727, 62737, 62757, 62795

REGIONAL GOVERNMENTS
62380, 62416, 62480, 62642, 62694, 62741, 62743, 62748

REGULATIONS
61681, 61753, 62255, 62271, 62273, 62307, 62320, 62322, 62337, 62339, 62342, 62343, 62344, 62348, 62352, 62353, 62355, 62363, 62364, 62375, 62376, 62377, 62378, 62380, 62393, 62395, 62406, 62408, 62410, 62413, 62420, 62429, 62440, 62441, 62442, 62444, 62449, 62461, 62467, 62470, 62472, 62482, 62485, 62486, 62487, 62488, 62496, 62497, 62499, 62501, 62502, 62503, 62505, 62506, 62508, 62519, 62522, 62523, 62529, 62531, 62532, 62533, 62534, 62537, 62545, 62546, 62547, 62549, 62550, 62552, 62554, 62557, 62564, 62579, 62585, 62587, 62588, 62589, 62591, 62594, 62598, 62599, 62600, 62601, 62602, 62603, 62604, 62612, 62613, 62617, 62619, 62621, 62628, 62632, 62634, 62645, 62655, 62668, 62671, 62673, 62674, 62677, 62678, 62679, 62680, 62681, 62682, 62683, 62684, 62705, 62706, 62707, 62714, 62715, 62716, 62721, 62725, 62726, 62727, 62746, 62749, 62755, 62757, 62767, 62774

REMOTE SENSING
61692, 62694

RENDERING PLANTS, GREASE AND TALLOW
62273

REPRESENTATIVE SAMPLING
62313

REPRODUCTION (BIOLOGICAL)
61361, 61426, 61479, [illegible], 61731, 61819, 61820, 61852, 61853, [illegible], 62066

RESEARCH METHODOLOGIES
61500, 61665, 61694, 61706, 61707, 61879, 61892, 62319, 62577

RESEARCH PROGRAMS
61665, 61706, 61707, 61708, 62278, 62285, 62319, 62336, 62349, 62354, 62367, 62399, 62421, 62426, 62455, 62570, 62577, 62580, 62615, 62622, 62624, 62635, 62653, 62694, 62719, 62720, 62722, 62729, 62731, 62733, 62740, 62746, 62748, 62752, 62753, 62757, 62758, 62771, 62778

RESIDENTIAL AREAS
61400, 61472, 61525, 61698, 61754, 61827, 61834, 62060, 62080, 62284, 62553, 62653

RESIDENTIAL SOURCES
61776

RESIDUAL OILS
61381, 62533, 62555

RESPIRATION (PLANTS)
61958, 61971, 62072, 62173, 62182, 62199, 62200

RESPIRATORY DISEASES
61349, 61350, 61356, 61358, 61372, 61374, 61375, 61384, 61386, 61387, 61389, 61394,

61395, 61396, 61398, 61399, 61401, 61402, 61404, 61412, 61419, 61420, 61421, 61430, 61435, 61436, 61437, 61438, 61439, 61442, 61443, 61445, 61451, 61468, 61471, 61474, 61475, 61478, 61484, 61486, 61488, 61493, 61494, 61498, 61499, 61504, 61505, 61506, 61512, 61514, 61515, 61516, 61522, 61525, 61528, 61530, 61532, 61533, 61534, 61535, 61543, 61544, 61546, 61547, 61548, 61554, 61557, 61563, 61565, 61566, 61570, 61573, 61576, 61578, 61579, 61580, 61581, 61582, 61584, 61585, 61587, 61589, 61591, 61592, 61597, 61599, 61602, 61603, 61605, 61607, 61615, 61617, 61621, 61623, 61624, 61625, 61626, 61631, 61632, 61637, 61642, 61649, 61654, 61655, 61656, 61658, 61661, 61662, 61664, 61667, 61669, 61670, 61671, 61676, 61679, 61691, 61694, 61699, 61700, 61701, 61703, 61712, 61713, 61716, 61717, 61721, 61722, 61727, 61728, 61729, 61732, 61733, 61742, 61744, 61748, 61752, 61759, 61760, 61766, 61769, 61775, 61777, 61780, 61789, 61791, 61795, 61796, 61797, 61804, 61806, 61811, 61814, 61815, 61817, 61818, 61821, 61822, 61823, 61825, 61827, 61832, 61835, 61840, 61845, 61848, 61850, 61851, 61868, 61875, 61877, 61881, 61884, 61886, 61890, 61895, 61897, 61902, 61905, 61914, 61916, 61924, 61975, 62075, 62083, 62328, 62372, 62396, 62422, 62455, 62590, 62686, 62739, 62777

RESPIRATORY SYSTEM
61355, 61359, 61360, 61364, 61366, 61370, 61372, 61374, 61376, 61377, 61378, 61379, 61380, 61386, 61396, 61404, 61406, 61415, 61416, 61423, 61424, 61425, 61427, 61428, 61432, 61433, 61447, 61459, 61460, 61465, 61470, 61478, 61481, 61489, 61496, 61498, 61510, 61519, 61521, 61524, 61527, 61528, 61529, 61548, 61549, 61579, 61580, 61584, 61586, 61588, 61593, 61597, 61598, 61601, 61603, 61604, 61617, 61620, 61623, 61633, 61636, 61641, 61642, 61643, 61647, 61651, 61652, 61653, 61654, 61655, 61657, 61671, 61672, 61673, 61677, 61683, 61684, 61685, 61686, 61687, 61688, 61689, 61694, 61695, 61698, 61701, 61702, 61706, 61710, 61715, 61716, 61718, 61720, 61732, 61740, 61741, 61744, 61754, 61757, 61759, 61769, 61771, 61775, 61782, 61788, 61802, 61810, 61811, 61816, 61818, 61820, 61823, 61824, 61825, 61832, 61833, 61835, 61841, 61844, 61847, 61848, 61856, 61874, 61875, 61879, 61880, 61881, 61884, 61887, 61896, 61897, 61898, 61900, 61901, 61902, 61907, 61910, 61913, 61919, 61924, 61990, 62022

RETAIL TRADE
62529, 62533, 62566

RETENTION
61352, 61367, 61368, 61405, 61461, 61485, 61556, 61620, 61708, 61738, 61745, 61787, 61790, 61793, 61797, 61824, 61853, 61860, 61861, 61862, 61865, 61871, 61886, 61922, 61986, 62055, 62141, 62156, 62169, 62202, 62580

RETROFIT PROGRAMS
62412, 62692

RHODE ISLAND
62501

RIBONUCLEIC ACIDS
61368, 61480, 61685, 61689, 61710, 61800

RICE
61783, 61798, 61928, 61935, 61940, 61941, 61944, 61945, 61947, 61950, 61955, 61957, 61958, 61959, 61961, 61962, 61975, 62004, 62007, 62033, 62039, 62041, 62042, 62062, 62075, 62076, 62078, 62089, 62092, 62096, 62099, 62101, 62107, 62108, 62131, 62133, 62162, 62175

RINGELMANN CHART
62322, 62707, 62721

RIVERS
62573

ROADS
61421, 61444, 61446, 61448, 61453, 61580, 61596, 61707, 61764, 61806, 61830, 61858, 61878, 61920, 61933, 62043, 62047, 62059, 62079, 62080, 62086, 62141, 62142, 62177, 62191, 62376, 62427, 62438, 62462, 62469, 62484, 62510, 62511, 62573, 62659, 62699, 62711

ROMANIA
61766, 61883, 62215, 62699

ROOTS
61961, 61962, 61982, 61999, 62036, 62066, 62087, 62089, 62172

ROSE
62012, 62093

ROTARY ENGINES
62605

RUBBER
62208, 62229

RUBBER AND MISCELLANEOUS PLASTICS PRODUC
61531, 61918

RURAL AREAS
61399, 61408, 61457, 61506, 61623, 61670, 61676, 61709, 61737, 61743, 61801, 61825, 61871, 62077, 62210, 62341, 62607

RYE
61957, 61958, 61961

S

SAFETY
61358, 61768, 62296, 62338, 62469, 62636, 62647, 62651

SAMPLERS
61770, 62295, 62656

SAN FRANCISCO
62666, 62755

SANITARY SERVICES
61367, 61792, 61869, 61872, 62278, 62313, 62322, 62333, 62344, 62345, 62358, 62377, 62379, 62382, 62420, 62470, 62489, 62499, 62555, 62573, 62612, 62651, 62704, 62725, 62727, 62737, 62757, 62795

SATELLITES (ARTIFICIAL)
62694

SCANDINAVIA
61484, 61485, 61499, 61531, 61694, 61735, 61739, 61801, 61852, 62006, 62168, 62212, 62248, 62270, 62409, 62481, 62662, 62691, 62713, 62722, 62765

SCOTCH PINE TREES
62168

SCRUBBERS
61768, 62248, 62266, 62279, 62367, 62561, 62633, 62729, 62782

SEA SALTS
62231

SECONDARY SCHOOL STUDENTS
61719

SECONDARY SMELTING AND REFINING OF NONFE
61406, 61419, 61467, 61499, 61586, 61961, 62006, 62040, 62041, 62062, 62067, 62068, 62099, 62123, 62133, 62240, 62377, 62561

SEDIMENTATION PHENOMENA
62696

SEED GERMINATION
62113

SEEDLINGS
62024, 62085

SELENIUM COMPOUNDS
61441, 61462, 61696, 61736, 61765

SEMI-CHEMICAL PULPING
62475

SERVICE INDUSTRIES
62613

SETTLING PARTICLES
61358, 61375, 61376, 61378, 61383, 61386, 61387, 61390, 61399, 61439, 61446, 61451, 61466, 61481, 61482, 61484, 61486, 61488, 61499, 61508, 61518, 61522, 61529, 61546, 61562, 61563, 61565, 61566, 61571, 61578, 61581, 61582, 61583, 61585, 61587, 61591, 61594, 61614, 61615, 61620, 61637, 61652, 61656, 61658, 61669, 61671, 61676, 61679, 61681, 61684, 61716, 61730, 61736, 61742, 61756, 61771, 61777, 61788, 61792, 61797, 61801, 61805, 61817, 61834, 61851, 61862, 61867, 61868, 61883, 61884, 61896, 61919, 61924, 61937, 61960, 61962, 61977, 61979, 61990, 61999, 62014, 62036, 62037, 62050, 62053, 62060, 62097, 62108, 62110, 62163, 62168, 62171, 62175, 62185, 62197, 62201, 62202, 62218, 62231, 62245, 62261, 62268, 62275, 62321, 62342, 62360, 62368, 62435, 62447, 62448, 62521, 62538, 62565, 62573, 62580, 62582, 62608, 62614, 62696, 62712, 62715, 62718, 62722, 62729

SEWAGE TREATMENT
61792, 61872, 62377, 62379, 62612

SEWERAGE SYSTEMS
61367, 61792, 61872, 62377, 62379, 62612, 62651

SHEEP
62202

SHOPPING CENTERS
62376

SHRUBS
62046, 62114

SILICATES
61774, 61980, 62175

SILICON COMPOUNDS
61386, 61563, 61582, 61774, 61788, 61896, 61919, 61980, 62175, 62209

SILICON DIOXIDE
61730, 61902

SILICOSIS
61902

SILVER COMPOUNDS
61921, 62065, 62226

SILVER IODIDE
62065

SIMULATION
61887, 62227, 62424, 62510, 62511, 62527, 62537, 62648, 62783

SINTERING
62532

SITE SELECTION
62433, 62513, 62636, 62695

SKIN (ANATOMY)
61542, 61586, 61668, 61816, 61875

SLAUGHTERING PLANTS
62273

SLUDGE
62651

SLUDGE INCINERATORS
62382, 62612

SMOG
61363, 61410, 61447, 61470, 61504, 61513, 61523, 61561, 61574, 61575, 61584, 61604, 61606, 61608, 61672, 61710, 61713, 61716, 61718, 61724, 61750, 61789, 61808, 61823, 61845, 61885, 61901, 61935, 61945, 61992, 61996, 61997, 62008, 62025, 62042, 62071, 62081, 62097, 62100, 62103, 62341, 62355, 62357, 62386, 62426, 62430, 62476, 62512, 62517, 62518, 62525, 62577, 62686, 62712, 62718, 62728, 62767, 62781

SMOKE SHADE
62275, 62293, 62322, 62451, 62554, 62614, 62645, 62707, 62721

SMOKEMETERS
62321

SMOKERS
61356, 61421, 61436, 61455, 61457, 61532, 61545, 61613, 61622, 61636, 61760, 61796, 61807, 61817, 61825, 61860, 61914, 61920

SMOKES
61358, 61387, 61457, 61479, 61482, 61498, 61518, 61571, 61613, 61622, 61752, 61756, 61760, 61766, 61769, 61777, 61781, 61797, 61801, 61814, 61818, 61821, 61844, 61846, 61852, 61861, 61863, 61867, 61897, 62097, 62134, 62162, 62185, 62187, 62206, 62207, 62237, 62273, 62280, 62281, 62331, 62393, 62448, 62451, 62472, 62502, 62614, 62662, 62722, 62777, 62779, 62797

SMOKING
61349, 61356, 61398, 61399, 61421, 61435, 61436, 61455, 61457, 61475, 61479, 61482, 61486, 61532, 61538, 61539, 61545, 61547, 61597, 61613, 61622, 61636, 61644, 61660, 61662, 61695, 61737, 61739, 61756, 61760, 61775, 61777, 61779, 61781, 61786, 61796, 61804, 61807, 61814, 61817, 61821, 61825, 61827, 61830, 61832, 61844, 61852, 61860, 61861, 61868, 61873, 61874, 61878, 61895, 61903, 61905, 61909, 61914, 61920, 62789

SOCIAL ATTITUDES
62213, 62284, 62333, 62479, 62643, 62698, 62727, 62735, 62745, 62761, 62764, 62766, 62768, 62770, 62773, 62774, 62775, 62776, 62779

SOCIO-ECONOMIC FACTORS
61483, 61536, 61753, 61766, 61777, 61849, 62213, 62249, 62253, 62254, 62256, 62258, 62259, 62262, 62264, 62269, 62273, 62275, 62280, 62281, 62285, 62286, 62294, 62310, 62331, 62391, 62458, 62473, 62542, 62571, 62597, 62632, 62636, 62643, 62664, 62711, 62713, 62732, 62759, 62760, 62761, 62762, 62764, 62766, 62768, 62771, 62772, 62773, 62774, 62775, 62777, 62778, 62779, 62790

SODIUM CHLORIDE
62015, 62026, 62219

SODIUM COMPOUNDS
61432, 61459, 62012, 62015, 62026, 62085, 62093, 62219

SODIUM SULFITE
61432, 62012

SOILING
61901, 61992, 62284

SOILS
61446, 61479, 61596, 61853, 61872, 61936, 61947, 61969, 61982, 61984, 61996, 62000, 62016, 62036, 62047, 62050, 62052, 62054, 62055, 62065, 62076, 62079, 62087, 62108, 62148, 62150, 62156, 62159, 62166, 62171, 62184, 62198, 62200, 62207, 62349, 62579, 62694

SOLAR RADIATION
61905, 62577, 62656

SOLUBILITY
61461, 61553

SOLVENT REFINING
61483

SOLVENTS
61481, 61568, 61841, 61900, 62373, 62398, 62407

SOOT
61358, 61529, 61581, 61582, 61684, 61736, 61883, 62201, 62218, 62342, 62360, 62447, 62608, 62614, 62718

SORGHUM
61951

SOURCE MONITORING
62242, 62289, 62291, 62313, 62351, 62365, 62370, 62450, 62464, 62479, 62506

SOUTH AFRICA
61871

SOUTH AMERICA
61807, 61904, 62713

SOUTH DAKOTA
62601

SOUTH PACIFIC
61569, 61614, 61769, 61775, 61781, 61844, 61858, 61991, 62046, 62249, 62340, 62374, 62472, 62513, 62656, 62728, 62761, 62763

SOX CONTROL
62205, 62234, 62241, 62248, 62266, 62267, 62272, 62532, 62552, 62634, 62782

SOYBEANS
61929, 61951, 62004, 62007, 62089, 62103, 62184

SPACE HEATING
62447

SPAIN
61404, 61777, 62620

SPECIFIC ION ELECTRODE
62090

SPECTROMETRY
61503, 61674, 61921, 62191, 62656

SPECTROPHOTOMETRY
61836, 61854, 61904

SPINACH
61942, 61955, 61996, 61997, 61998, 61999, 62002, 62003, 62004, 62041, 62103, 62127

SPORES
61770

SPORTS COMPLEXES
62376

SPRAYS
61792, 62718

SPRUCE TREES
62023

SPUTUM
61356, 61374, 61419, 61514, 61580, 61582, 61591, 61597, 61599, 61607, 61649, 61662, 61670, 61717, 61721, 61729, 61764, 61795, 61868

ST LOUIS
61707, 62424, 62452, 62637, 62743

STABILITY (ATMOSPHERIC)
61916, 62003, 62280, 62525, 62712, 62720

STACK GASES
61618, 61655, 61768, 61991, 62198, 62205, 62206, 62215, 62235, 62241, 62242, 62244, 62248, 62250, 62251, 62267, 62322, 62342, 62365, 62381, 62464, 62522, 62530, 62552, 62564, 62614, 62645, 62697, 62707, 62721, 62728, 62755, 62780, 62783, 62787, 62791

STACK HEIGHT
62342, 62437, 62782

STACK MONITORING
62242, 62291

STACKS
62205, 62215, 62250, 62279, 62281, 62342, 62437, 62780, 62782, 62783, 62784, 62785, 62787, 62791, 62797

STAGNATION
61916

STATE GOVERNMENTS
61899, 62300, 62323, 62324, 62365, 62380, 62394, 62415, 62441, 62442, 62475, 62522, 62528, 62531, 62535, 62566, 62632, 62642, 62649, 62650, 62688, 62695, 62701, 62705, 62714, 62721, 62730, 62733, 62735, 62736, 62737, 62739, 62740, 62742, 62743, 62744, 62745, 62746, 62747, 62748, 62750, 62792

STATISTICAL ANALYSES
61349, 61354, 61389, 61435, 61488, 61521, 61543, 61546, 61561, 61564, 61578, 61599, 61605, 61645, 61669, 61735, 61752, 61889, 61890, 61892, 61897, 61938, 62051, 62119, 62167, 62208, 62214, 62223, 62241, 62253, 62280, 62303, 62511, 62512, 62527, 62538, 62583, 62708, 62759, 62765

STEAM
62247

STEAM ELECTRIC POWER GENERATION
62075, 62110, 62121, 62215, 62241, 62248, 62250, 62266, 62272, 62281, 62322, 62337, 62377, 62379, 62381, 62434, 62467, 62487, 62488, 62509, 62522, 62545, 62693, 62697, 62698, 62783

STEEL
62208, 62228, 62231, 62277, 62729

STIPPLING
62144

STIRLING CYCLE ENGINES
62634

STOMATA
61969, 61982, 61983, 61987, 62021, 62064, 62087, 62089, 62169, 62175, 62182

STONE
62216, 62219, 62222, 62225, 62229

STONE, CLAY, GLASS, AND CONCRETE PRODUCT
61493, 62050, 62095, 62175, 62377, 62379, 62435

STORAGE FACILITIES (BULK LIQUID)
62377, 62379, 62529, 62566, 62612, 62704

STRATIFIED CHARGE ENGINES
62605, 62634

STREETS
61830, 61858, 61878

STRONTIUM COMPOUNDS
61953, 62148

STRUCTURES
61830, 61858, 61878, 62086, 62212, 62218, 62222, 62229, 62282, 62318, 62449, 62657

STUDENTS
61564, 61592, 61719, 62517

SUBSURFACE STRUCTURES
61858, 62086

SUBURBAN AREAS
61569, 61776, 61914, 62077, 62124, 62783

SULFATES
61459, 61494, 61627, 61659, 61706, 61707, 61708, 61733, 61734, 61748, 61772, 61810, 61901, 62231, 62305, 62396, 62590, 62607, 62610, 62637, 62662

SULFATION-OF-LEAD METHODS
62305

SULFHYDRYL COMPOUNDS
61730, 61904

SULFIDES
61390, 61447, 61450, 61482, 61755, 61819, 61850, 61900, 61901, 61990, 62229, 62247, 62305, 62308, 62325, 62424, 62453, 62534, 62627, 62637, 62665, 62723

SULFITE PULPING
62475, 62485

SULFITES
61627, 62157, 62182

SULFUR COMPOUNDS
61390, 61404, 61447, 61450, 61459, 61482, 61483, 61494, 61575, 61627, 61659, 61706, 61707, 61708, 61733, 61734, 61736, 61748, 61755, 61772, 61774, 61810, 61819, 61850, 61900, 61901, 61936, 61953, 61956, 61962, 61984, 61990, 61993, 61994, 62004, 62016, 62018, 62019, 62053, 62083, 62092, 62120, 62122, 62125, 62137, 62157, 62166, 62182, 62193, 62199, 62216, 62220, 62229, 62231, 62239, 62247, 62263, 62305, 62308, 62325, 62372, 62387, 62396, 62424, 62453, 62485, 62523, 62534, 62579, 62590, 62607, 62610, 62617, 62627, 62637, 62662, 62665, 62723, 62779

SULFUR DIOXIDE
61353, 61375, 61381, 61384, 61389, 61409, 61411, 61432, 61433, 61447, 61468, 61492, 61494, 61521, 61522, 61525, 61535, 61546, 61547, 61562, 61573, 61575, 61581, 61583, 61584, 61585, 61587, 61617, 61618, 61626, 61627, 61634, 61649, 61664, 61667, 61669, 61680, 61695, 61698, 61701, 61707, 61710, 61730, 61733, 61734, 61748, 61752, 61754, 61755, 61756, 61759, 61766, 61769, 61772, 61780, 61781, 61810, 61811, 61815, 61821, 61825, 61845, 61847, 61855, 61859, 61863, 61880, 61890, 61895, 61897, 61900, 61901, 61925, 61928, 61934, 61935, 61937, 61939, 61943, 61958, 61966, 61968, 61971, 61974, 61980, 61983, 61987, 61991, 61995, 62002, 62003, 62004, 62016, 62024, 62028, 62029, 62032, 62034, 62035, 62044, 62046, 62057, 62064, 62066, 62074, 62077, 62082, 62084, 62089, 62092, 62094, 62097, 62101, 62111, 62112, 62113, 62118, 62120, 62122, 62137, 62140, 62146, 62147, 62151, 62152, 62153, 62155, 62157, 62169, 62182, 62183, 62185, 62189, 62190, 62192, 62193, 62199, 62203, 62205, 62207, 62208, 62210, 62213, 62214, 62218, 62219, 62226, 62227, 62229, 62234, 62241, 62257, 62275, 62281, 62287, 62291, 62294, 62295, 62303, 62305, 62311, 62322, 62339, 62342, 62351, 62354, 62365, 62368, 62370, 62372, 62381, 62396, 62401, 62404, 62405, 62419, 62421, 62424, 62431, 62447, 62451, 62485, 62487, 62488, 62489, 62496, 62498, 62500, 62501, 62503, 62505, 62506, 62508, 62513, 62521, 62527, 62532, 62539, 62549, 62551, 62553, 62558, 62565, 62568, 62582, 62584, 62587, 62588, 62589, 62590, 62591, 62592, 62593, 62594, 62595, 62596, 62597, 62598, 62599, 62600, 62601, 62602, 62603, 62604, 62607, 62608, 62626, 62634, 62637, 62638, 62641, 62653, 62662, 62665, 62667, 62673, 62674, 62675, 62676, 62677, 62678, 62679, 62680, 62681, 62682, 62683, 62684, 62690, 62697, 62702, 62703, 62706, 62708, 62712, 62715, 62722, 62723, 62726, 62759, 62779, 62791, 62797

SULFUR ORGANIC COMPOUNDS
61520, 61730, 61904, 62211, 62305, 62398, 62453, 62627, 62665

SULFUR OXIDES
61353, 61375, 61381, 61384, 61389, 61390, 61399, 61409, 61411, 61412, 61432, 61433, 61438, 61447, 61468, 61488, 61492, 61494, 61521, 61522, 61525, 61534, 61535, 61546, 61547, 61562, 61565, 61566, 61573, 61575, 61578, 61581, 61582, 61583, 61584, 61585, 61587, 61605, 61617, 61618, 61626, 61627, 61634, 61649, 61656, 61661, 61664, 61667, 61669, 61680, 61695, 61698, 61701, 61707, 61710, 61716, 61719, 61730, 61733, 61734, 61736, 61744, 61748, 61752, 61754, 61755, 61756, 61759, 61766, 61769, 61772, 61780, 61781, 61810, 61811, 61815, 61821, 61825, 61845, 61847, 61851, 61855, 61859, 61863, 61880, 61890, 61894, 61895, 61897, 61900, 61901, 61925, 61928, 61934, 61935, 61937, 61939, 61943, 61958, 61960, 61966, 61968, 61971, 61974, 61980, 61983, 61987, 61991, 61995, 62002, 62003, 62004, 62011, 62014, 62016, 62019, 62021, 62024, 62028, 62029, 62032, 62034, 62035, 62044, 62046, 62057, 62064, 62066, 62073, 62074, 62075, 62077, 62082, 62083, 62084, 62089, 62092, 62094, 62097, 62101, 62111, 62112, 62113, 62118, 62120, 62122, 62129, 62137, 62138, 62139, 62140, 62146, 62147, 62151, 62152, 62153, 62155, 62157, 62163, 62169, 62175, 62178, 62182, 62183, 62185, 62189, 62190, 62192, 62193, 62199, 62203, 62205, 62207, 62208, 62210, 62213, 62214, 62218, 62219, 62224, 62225, 62226, 62227, 62229, 62234, 62241, 62244, 62257, 62261, 62275, 62281, 62282, 62287, 62291, 62294, 62295, 62303, 62305, 62311, 62322, 62331, 62337, 62339, 62342, 62351, 62354, 62365, 62368, 62370, 62372, 62381, 62396, 62401, 62404, 62405, 62419, 62421, 62424, 62431, 62447, 62451, 62485, 62486, 62487, 62488, 62489, 62496, 62498, 62500, 62501, 62503, 62505, 62506, 62508, 62513, 62518, 62520, 62521, 62525, 62527, 62532, 62533, 62539, 62549, 62551, 62553, 62558, 62565, 62568, 62572, 62582, 62584, 62585, 62587, 62588, 62589, 62590, 62591, 62592, 62593, 62594, 62595, 62596, 62597, 62598, 62599, 62600, 62601, 62602, 62603, 62604, 62605, 62607, 62608, 62626, 62629, 62634, 62637, 62638, 62641, 62653, 62662, 62665, 62667, 62673, 62674, 62675, 62676, 62677, 62678, 62679, 62680, 62681, 62682, 62683, 62684, 62690, 62697, 62702, 62703, 62706, 62708, 62712, 62715, 62718, 62722, 62723, 62726, 62759, 62779, 62791, 62797

SULFUR PRODUCTION
62498

SULFUR TRIOXIDE
61399, 61447, 61584, 61585, 61719, 61897, 61901, 62129, 62138, 62146, 62175, 62224, 62305, 62508

SULFURIC ACID
61384, 61478, 61494, 61523, 61550, 61702, 61705, 61706, 61707, 61734, 61810, 61901, 61979, 61983, 62146, 62161, 62183, 62205, 62222, 62281, 62305, 62322, 62368, 62508, 62530, 62560, 62610, 62780

SULFURIC ACID PLANTS
62377, 62487, 62498, 62505, 62508, 62530, 62555, 62560

SUNFLOWER
62081

SURFACE COATING OPERATIONS
62704

SURFACE COATINGS
61853, 61893, 62202, 62208, 62214, 62227, 62229, 62230, 62282

SURFACE PROPERTIES
61433, 62231

SURFACE TENSION
61433

SURVEY METHODS
62196, 62276, 62405, 62411, 62543, 62563, 62638, 62665, 62708, 62712, 62719

SUSPENDED PARTICULATES
61358, 61363, 61364, 61384, 61387, 61404, 61410, 61447, 61457, 61470, 61479, 61482, 61486, 61498, 61504, 61513, 61518, 61523, 61533, 61561, 61571, 61574, 61575, 61582, 61584, 61604, 61606, 61608, 61613, 61618, 61622, 61634, 61637, 61672, 61681, 61702, 61710, 61713, 61716, 61718, 61724, 61733, 61750, 61752, 61754, 61756, 61760, 61766, 61769, 61772, 61777, 61781, 61789, 61797, 61801, 61808, 61814, 61818, 61821, 61823, 61824, 61844, 61845, 61846, 61852, 61861, 61863, 61867, 61869, 61885, 61897, 61901, 61935, 61945, 61992, 61996, 61997, 62008, 62025, 62042, 62052, 62070, 62071, 62081, 62085, 62097, 62100, 62103, 62113, 62134, 62162, 62185, 62187, 62206, 62207, 62237, 62273, 62275, 62280, 62281, 62305, 62311, 62328, 62331, 62341, 62355, 62357, 62386, 62393, 62396, 62421, 62424, 62426, 62430, 62448, 62451, 62470, 62472, 62476, 62494, 62502, 62508, 62512, 62517, 62518, 62525, 62527, 62558, 62561, 62577, 62587, 62588, 62589, 62591, 62592, 62593, 62594, 62595, 62596, 62597, 62598, 62599, 62600, 62601, 62602, 62603, 62604, 62614, 62623, 62626, 62628, 62657, 62662, 62673, 62674, 62675, 62676, 62677, 62678, 62679, 62680, 62681, 62682, 62683, 62684, 62686, 62712, 62718, 62722, 62728, 62729, 62767, 62777, 62779, 62781, 62797

SWEDEN
61484, 61485, 62248, 62270, 62481, 62691, 62713, 62765

SWITZERLAND
61596, 61678, 61690, 61766, 61770, 61831, 61913, 62066, 62359, 62362, 62448, 62516

SYNERGISM
61371, 61378, 61381, 61405, 61417, 61434, 61438, 61485, 61494, 61518, 61575, 61619, 61632, 61633, 61640, 61641, 61672, 61680, 61697, 61710, 61713, 61718, 61750, 61760, 61781, 61784, 61816, 61827, 61855, 61859, 61866, 61876, 61883, 61905, 61926, 62002, 62029, 62035, 62082, 62109, 62146, 62147, 62190, 62197, 62312

SYNTHETIC FIBERS
61450, 62229

SYNTHETIC RUBBER PLANTS
61567

T

TALL STACK ISSUE
62437

TARS (POLLUTANTS)
61736, 61760, 61905, 62614

TAXATION
62253, 62263, 62286, 62384, 62439, 62643, 62713, 62735, 62749, 62768

TEA
61952, 62001, 62004

TEETH
61419, 61427

TELLURIUM COMPOUNDS
61696

TEMPERATURE
61826, 62203, 62780

TEMPERATURE (ATMOSPHERIC)
61521, 61575, 61733, 61754, 61845, 61890, 61905, 61948, 61982, 62058, 62657, 62720, 62728

TEMPERATURE GRADIENT
62003, 62712

TENNESSEE
62311

TERMINOLOGY
62416

TETRAETHYL LEAD
62177

TEXAS
62534, 62550, 62690

TEXTILE MILLS
61493, 61850, 61884

TEXTILES
61450, 61742, 62208, 62229, 62282

THIOPHENE
62305

THRESHOLDS
61438, 61460, 61508, 61553, 61555, 61691, 61696, 61733, 61742, 61753, 61773, 61785, 61794, 61823, 61866, 61875, 61876, 61880, 61884, 61893, 61894, 61900, 61901, 61911, 61914, 61915, 61946, 62053, 62149, 62308, 62319, 62329, 62429

THROAT IRRITATION
61575, 61724, 61851

THROUGHPUT
62612

TIMED FUEL INJECTION
62723

TIN
61922

TIN COMPOUNDS
61921, 62060

TIP BURN
62204, 62207

TIRES
62208

TISSUE CULTURES
61706, 61896

TISSUES
61361, 61368, 61377, 61460, 61462, 61485, 61496, 61511, 61602, 61611, 61706, 61708, 61738, 61741, 61790, 61829, 61853, 61855, 61857, 61866, 61881, 61888, 61896, 62021, 62028, 62179, 62191, 62202

TITANIUM COMPOUNDS
61886, 61902, 61921, 61923, 61953

TOBACCO
61818, 61958, 61980, 62030, 62097, 62118, 62147, 62173, 62176

TOBACCO SMOKE
61457, 61479, 61482, 61498, 61613, 61622, 61760, 61781, 61814, 61821, 61844, 61852, 61861

TOKYO
61389, 61392, 61400, 61401, 61416, 61418, 61444, 61506, 61524, 61543, 61625, 61651, 61653, 61684, 61712, 61719, 61808, 61895, 61932, 61965, 61973, 61997, 61998, 62038, 62077, 62111, 62132, 62236, 62320, 62417, 62476, 62517, 62606, 62686, 62708, 62712, 62718, 62767

TOLUENES
61568, 61606, 61774, 61841, 62327

TOMATOES
61935, 61979, 61999, 62004, 62026, 62045, 62081, 62089, 62093, 62106, 62109, 62172

TOPOGRAPHIC INTERACTIONS
61467, 62043, 62100, 62416, 62496, 62728, 62755

TOTAL HYDROCARBONS
62424, 62431

TOXIC TOLERANCES
61368, 61455, 61484, 61528, 61531, 61658, 61685, 61686, 61687, 61688, 61689, 61747, 61748, 61794, 61813, 61837, 61863, 61864, 61866, 61875, 61876, 61894, 61900, 61923, 61946, 61951, 62006, 62008, 62042, 62046, 62049, 62115, 62139, 62147, 62190, 62205, 62312

TOXICITY
61355, 61358, 61368, 61440, 61441, 61450, 61457, 61462, 61470, 61479, 61483, 61484, 61485, 61531, 61537, 61541, 61553, 61554, 61555, 61558, 61596, 61600, 61602, 61616, 61627, 61630, 61634, 61640, 61658, 61668, 61681, 61685, 61686, 61687, 61688, 61689, 61705, 61706, 61707, 61708, 61720, 61734, 61747, 61748, 61760, 61761, 61773, 61774, 61775, 61784, 61788, 61790, 61799, 61809, 61811, 61816, 61819, 61823, 61828, 61837, 61841, 61845, 61846, 61847, 61849, 61852, 61855, 61857, 61858, 61864, 61869, 61875, 61878, 61880, 61881, 61887, 61891, 61894, 61900, 61901, 61904, 61908, 61910, 61912, 61913, 61915, 61917, 61923, 61924, 61926, 61972, 62044, 62045, 62052, 62082, 62115, 62126, 62135, 62139, 62146, 62147, 62149, 62153, 62154, 62165, 62168, 62180, 62187, 62188, 62190, 62197, 62199, 62202, 62204, 62205, 62319, 62336, 62398, 62471, 62541, 62590

TRACE ANALYSIS
61745, 61869, 62150

TRACERS
61579, 61787, 61898, 62174

TRACHEA
61470, 61620, 61647, 61672, 61695, 61701, 61702, 61759, 61782, 61832, 61847, 61898

TRADE ASSOCIATIONS
62729, 62738, 62769

TRANSMISSOMETERS
62321

TRANSPORT
61618, 61858, 62000, 62050, 62174, 62471, 62580, 62586, 62590, 62653

TRANSPORTATION CONTROL PLANS
62388, 62407, 62510, 62511, 62512, 62513, 62559, 62632, 62633, 62640, 62644, 62649, 62655, 62692

TRANSPORTATION PLANNING
62388, 62414, 62462, 62483, 62510, 62511, 62554, 62632, 62640, 62642, 62659, 62666

TREES
61783, 61927, 61933, 61934, 61936, 61952, 61956, 61966, 61968, 61974, 61975, 61976, 61977, 61992, 61993, 61994, 61995, 62005, 62006, 62011, 62019, 62020, 62021, 62023, 62024, 62027, 62028, 62043, 62046, 62047, 62049, 62056, 62060, 62061, 62069, 62073, 62079, 62080, 62084, 62085, 62086, 62093, 62098, 62104, 62107, 62111, 62113, 62120, 62122, 62123, 62124, 62125, 62132, 62137, 62138, 62143, 62148, 62158, 62159, 62160, 62168, 62169, 62199, 62201, 62204, 62207, 62582, 62699

TRENDS
61400, 61475, 61525, 61534, 61547, 61581, 61607, 61662, 61670, 61712, 61737, 61766, 61804, 61873, 61915, 61970, 62005, 62038, 62148, 62195, 62235, 62246, 62252, 62260, 62261, 62272, 62278, 62320, 62331, 62333, 62334, 62347, 62430, 62526, 62656, 62658, 62662, 62666, 62670, 62694, 62734, 62745, 62749, 62754, 62790, 62793, 62795

TRUCKS
62502, 62562, 62649

TUBERCULOSIS
61506, 61514

TUMORS
61352, 61355, 61457, 61518, 61529, 61540, 61554, 61577, 61651, 61737, 61746, 61816, 61818, 61881, 61919

TUNNELS
61858, 62086

TURBOFAN ENGINES
62393

TURBOJET ENGINES
62393

TURBULENCE (ATMOSPHERIC)
62368

TURNIPS
62004, 62093, 62103

U

ULTRAVIOLET RADIATION
61490, 61845, 62712

UNITED KINGDOM
61457, 61464, 61495, 61643, 61681, 61682, 61738, 61749, 61751, 61752, 61769, 61796, 61818, 61830, 61853, 61856, 61896, 61905, 61907, 61909, 61919, 61985, 62006, 62202, 62203, 62225, 62237, 62270, 62281, 62283, 62357, 62425, 62570, 62617, 62621, 62647, 62662, 62713, 62791

UNITED STATES
61353, 61361, 61446, 61596, 61707, 61733, 61815, 61854, 61915, 61953, 62056, 62121, 62177, 62191, 62196, 62206, 62207, 62253, 62258, 62270, 62274, 62275, 62278, 62280, 62284, 62300, 62311, 62312, 62317, 62323, 62324, 62344, 62366, 62373, 62375, 62376, 62377, 62378, 62379, 62380, 62394, 62395, 62402, 62403, 62404, 62407, 62409, 62415, 62424, 62440, 62441, 62442, 62443, 62444, 62445, 62446, 62451, 62452, 62459, 62469, 62470, 62484, 62485, 62486, 62488, 62489, 62490, 62491, 62492, 62493, 62494, 62495, 62496, 62498, 62499, 62501, 62503, 62504, 62508, 62509, 62512, 62527, 62529, 62530, 62531, 62532, 62533, 62534, 62536, 62544, 62548, 62549, 62550, 62551, 62552, 62553, 62554, 62556, 62559, 62566, 62572, 62575, 62576, 62577, 62580, 62589, 62591, 62592, 62593, 62594, 62595, 62596, 62598, 62599, 62600, 62601, 62602, 62603, 62604, 62637, 62644, 62650, 62656, 62666, 62673, 62674, 62675, 62676, 62677, 62678, 62679, 62680, 62681, 62682, 62683, 62684, 62690, 62703, 62717, 62723, 62725, 62734, 62739, 62743, 62745, 62747, 62755, 62757, 62759, 62772, 62775, 62777, 62779, 62782, 62790, 62795

UNIVERSITIES
62262

UNLEADED GASOLINES
62547, 62557

URANIUM COMPOUNDS
61636

URBAN AREAS
61383, 61446, 61455, 61457, 61475, 61509, 61526, 61569, 61624, 61627, 61642, 61676, 61709, 61734, 61757, 61825, 61845, 61854, 61858, 61860, 61861, 61871, 61877, 61878, 61889, 61890, 61895, 61909, 62058, 62071, 62124, 62141, 62152, 62159, 62167, 62191, 62199, 62210, 62212, 62213, 62225, 62253, 62275, 62281, 62312, 62320, 62369, 62374, 62383, 62388, 62389, 62391, 62424, 62484, 62537, 62573, 62577, 62579, 62586, 62644, 62659, 62662, 62667, 62671, 62672, 62691, 62708, 62711, 62712, 62717, 62718, 62722, 62728, 62736, 62739, 62743, 62748, 62755, 62757, 62776, 62779, 62783, 62788, 62797

URINE
61367, 61382, 61400, 61405, 61418, 61419, 61427, 61431, 61449, 61453, 61463, 61467, 61473, 61485, 61509, 61526, 61582, 61588, 61590, 61619, 61648, 61654, 61655, 61670, 61714, 61717, 61730, 61763, 61767, 61783, 61793, 61798, 61805, 61841, 61855, 61862, 61863, 61877, 61878, 61888, 61906, 61917, 61922

USSR
61450, 61492, 61549, 61554, 61555, 61563, 61577, 61596, 61635, 61639, 61642, 61659, 61682, 61696, 61771, 61773, 61790, 61809, 61819, 61837, 61847, 61866, 61876, 61912, 61918, 61923, 62005, 62115, 62148, 62166, 62198, 62217, 62223, 62250, 62292, 62302, 62317, 62318, 62319, 62329, 62399, 62425, 62670, 62713, 62785

UTAH
61733, 62403, 62682

V

VALLEYS
62280

VANADIUM COMPOUNDS
61381, 61537, 61556, 61582, 61663, 61685, 61686, 61862, 61904, 61921, 61953, 62110

VAPOR PRESSURE
61857

VAPOR RECOVERY SYSTEMS
62507, 62529, 62550, 62566

VAPORS
61549, 61600, 61683, 61691, 61775, 61838, 61839, 61844, 61876, 62247, 62529, 62550

VARIANCES
62377, 62380, 62493, 62527, 62587, 62588, 62589, 62592, 62593, 62594, 62595, 62596, 62675, 62676, 62697

VEGETABLES
61427, 61655, 61928, 61935, 61940, 61942, 61951, 61955, 61975, 61979, 61982, 61985, 61986, 61989, 61996, 61997, 61998, 61999, 62002, 62003, 62004, 62016, 62026, 62029, 62040, 62041, 62045, 62062, 62081, 62085, 62089, 62093, 62100, 62103, 62106, 62109, 62110, 62126, 62127, 62128, 62140, 62141, 62149, 62151, 62162, 62171, 62172, 62180, 62204

VEHICULAR TRAFFIC
61407, 61448, 61453, 61509, 61580, 61714, 61806, 62000, 62366, 62462, 62573, 62575, 62620, 62655, 62659, 62666

VENTILATION
61358, 61367, 61600, 61683, 61881, 61884, 61918, 62218, 62449, 62657

VENTILATION (PULMONARY)
61437, 61668, 61691, 61697, 61796, 61835, 61889

VENTURI SCRUBBERS
62279

VERMONT
62344, 62459

VESSELS (MARINE)
61893, 62550

VIOLET
62164

VIRGINIA
62548, 62591

VIRUSES
61471, 61756, 61791, 61792, 62115

VISIBILITY
62280, 62290, 62329, 62424, 62449, 62450, 62464, 62746, 62777

VITAL CAPACITY
61350, 61436, 61532, 61572, 61666, 61764, 61767, 61769

VITAMINS
61428, 61482, 61489, 61710

W

WASHINGTON (STATE)
62531, 62556

WASHINGTON D C
62253, 62469, 62470

WASHOUT
62590

WASTE GAS CONTROL
62205, 62234, 62235, 62241, 62248, 62252, 62266, 62267, 62272, 62532, 62552, 62633, 62634, 62782, 62787

WASTE GASES
61404, 61440, 61483, 61488, 61528, 61591, 61605, 61618, 61655, 61677, 61759, 61768, 61789, 61850, 61987, 61991, 62073, 62092, 62093, 62095, 62134, 62161, 62162, 62168, 62187, 62198, 62205, 62206, 62215, 62219, 62222, 62234, 62235, 62240, 62241, 62242, 62244, 62248, 62250, 62251, 62267, 62287, 62289, 62310, 62322, 62342, 62360, 62365, 62381, 62429, 62435, 62447, 62464, 62465, 62475, 62513, 62518, 62522, 62530, 62552, 62564, 62614, 62623, 62645, 62673, 62697, 62707, 62721, 62728, 62755, 62780, 62783, 62787, 62791

WATER
61969, 61982, 62015

WATER BODIES
61872, 62236, 62277, 62278, 62349, 62357, 62436, 62606, 62609, 62636, 62642, 62686, 62694, 62713, 62714, 62720, 62727, 62758

WATER POLLUTION
61872, 62236, 62277, 62278, 62349, 62357, 62436, 62606, 62609, 62636, 62642, 62686, 62694, 62713, 62714, 62720, 62727, 62758

WATER SOLUBLE FRACTION
62092

WAVELENGTHS
62577

WEATHER MODIFICATION
62065

WEEKLY
61517, 61664

WEIGHT
61510, 61649, 61677

WELLMAN LORD PROCESS
62634

WEST AND GAEKE METHOD (SO2)
61901, 62539

WEST VIRGINIA
62603

WHEAT
61951

WIND TUNNELS
61989

WINDS
61719, 62062, 62178, 62223, 62280, 62341, 62583, 62612, 62712, 62720, 62728

WISCONSIN
62490

WOOD (MATERIAL)
61482, 62201

WOOD FUELS
62345, 62556

WRECKING AND DEMOLITION
62449

X

X-RAY FLUORESCENCE SPECTROMETRY
61674

X-RAYS
61466, 61636, 61853

Y

YOKKAICHI
61375, 61395, 61584, 62074, 62075, 62130, 62301

YOKOHAMA
61504, 62159, 62355

YUGOSLAVIA
61467, 61493, 61674, 61743, 61765, 61865, 62447, 62641

Z

ZINC
62210, 62224

ZINC COMPOUNDS
61380, 61390, 61405, 61619, 61620, 61653, 61659, 61687, 61688, 61730, 61738, 61902, 61921, 61947, 61953, 61954, 61984, 61985, 61999, 62020, 62044, 62048, 62053, 62076, 62079, 62080, 62114, 62156, 62171, 62184, 62197, 62525

ZINC PRIMARY SMELTING AND REFINING
61452, 61957, 61960, 62020, 62044, 62197, 62532

ZIRCONIUM COMPOUNDS
61582, 61921, 61953, 62060

AUTHOR INDEX

A

AASE G 62755
ABE K 61663, 61697
ABE T *61445
ABERNETHY D R 61685, 61689
ABIDIN B I *61809
ACKETA M 61493
ADACHI A 62047, 62048
ADACHI M *61349, 61578
ADACHI S *61350
ADAM W D 61579
ADAMS B 61478
ADLER M W 61796
AGASATO S 61587
AGOSTINO B D 62527
AIHARA K 61550, *61979
AIZAWA M 61393
AIZAWA R 61520
AKITA H 61664
AKIYAMA K 61400
AKSELSSON R 61953
ALARIE Y 61879
ALBERT R E 61832
ALEKSAKHIN R M 62148
ALEXANDER I *62279
ALLCROFT R *62202
ALTMAN D G 61752
ALTSHULLER A P *62719
AMANN H P 61869
AMAYA K *61351
AMBIO 62085
AMDUR M O *61810
AMIMOTO M 61547
AMORT H *61902
ANDERSON C R 61990
ANDERSON S J *62759
ANDO H 61783
ANDO J *62235
ANDO M 62083, *62104
ANDO T 62080, *62355
ANGELETTI E M *62688
ANGERER J 61779
ANGLE C R *61446
ANINA I A 61773
ANN REV PHARMACOL 61644
ANTONYUZHENKO V A *61912
ANTWEILER H *61447, *61811, *62292
AOKI I *62236
AOKI K 61409, *61448
AOKI M *61980, 62026, 62086, 62118
AOKI T 61366
AOYAGI Y *61925
AOYAMA H 61585
AOYAMA K 61673
APELBAUM A *62179
ARAI T 62112
ARAKI S *61352, *61449
ARHIRII M 61766
ARIMATSU Y 61568
ARMBRUSTER L 61824
ARMENTROUT D W *62356
ARMSTRONG D D *62707
ARNDT U *62165
ARTALEJO J 61777
ARUNACHALAM N 62050
ARVIK J H *62105
ASAI C 61937
ASAI T 61936
ASAKAWA F *61981, *61982, *62106
ASAKINO K *62708
ASHIDA K 62070
ASKEW M *62357
ASO T 61550
ASTRUP P *61852, *61903
ATABAEV S T 62670
ATKINSON S E *62631
AXETELL K *62358
AYER H E *61884

B

BABA T *61983
BABCOCK L R JR *61353
BACK K C 61908
BAKER P W *62237
BALABAJEWA L 61755
BALDWIN T E 62576
BALILES G L *62632
BALLARD R 62295
BANASOVA V *61984
BANNO K 61607
BAR SHALOM Y *61354
BARBER J 61985
BARBOUR M G *62135
BARDELLI U *62229
BARGETZI S *62359
BARILIAK I R *61450
BARLTROP D *61853
BARRERE P 61914
BARRETT L B *62276
BARRINGER A R 61985
BASMADSHIJEWA K *61730
BASU P K *61885
BAUM F *62360
BAUM R *62633
BAUSUM H T 61792
BAYH B *62731
BEAUFORD W *61985
BECK A R 62152
BECK D A *62293
BECK E G *61451
BEDERKA J P JR *61731
BEJAOUI M 61611
BELGEA F J *62786
BELKIN V I 61809
BENCKO V 61463
BENEMANSKIY V V 61577
BENJAMIN L 61675
BENSON F B 62396, 62652
BENSON G E *62294, *62361
BERARD P *62238
BERGER J M 61832
BERGLUND B *62765
BERGLUND U 62765
BERMAN E *61355
BERRY M *62761
BEVERIDGE T R 62790
BIANCHI R 62216
BIESTEK T *62210
BINGHAM T H *62263
BLACKBURN C R B 61769
BLADEN W A *62760
BLANKINSHIP J W *62206
BLOMQUIST E T *61915
BLOT W J *61452
BLUM S C *61986
BLUMER W *61453
BOFHLEN B *62362
BOERKER E *62363
BOESCH L *62634
BOGEN D C *61854
BOGGS J C *62792
BOHNING D E 61832
BOMPART G 61454
BONOTTO S *62136
BONTE J *61987
BORMANN F H 62085
BOSTON P 61484
BOURBON P *61454
BOURDEAU 61751
BOURDEAU P 62398
BOYD J W 62365
BRADY G 62384
BRAENDLE R 62066
BRAIL R K *62364
BRANDT R H *61812
BRAVO 62662
BREISACHER P 61501
BRENNAN E 62056
BRIDBORD K *61455
BRIGGS E 62782
BRILLE 61751
BRITTAIN D T 62515
BROECKER W S 62174
BROMBERGER BARNEA B 61628
BROOKS A G F 61796
BROWN D W 62421
BRUAUX P *61813
BRUBAKER P E 62396
BRUCE P 61622
BRUCE R G *62239
BRUECKER R 61869
BRUNSKILL G J 62174
BRYAN R J *62365
BRYAN S D *61456
BRYANT D A *62366, 62510, 62511
BUCARELLI A 61741
BUCKLEY P D 61614
BUCKLEY R D 61500, 61502
BUDENAERS D 61354
BUGRYSHEV P F 61554
BURCK D 61630
BURCKLE J O *62367
BURGER E J JR *62635
BURGER J W 62515
BURNHAM J B *62636
BURTON C S *62637
BURTON R M *62295
BUSEY W M *61855
BUSI R *62368
BUTCHER B 61691
BUTLER J D *61457
BYRNE A R 61765, 61865
BYRON P 62373

C

CALVERT S *62732
CAMERON J W *61988
CAMERON P *61814
CAMMPBELL J A 61687
CAMPBELL J A 61688
CANO N 61786
CAPITAINE C 61913
CAPLAN P 61455
CARETTO L S *62638
CARNOW 61751
CARNOW B W *61732, *61815
CARROLL J C *62639
CARSON E H 62273
CASO C 61404
CASSAN S M *61458
CASTALINE A H 62366, 62462, 62511
CASTLEMAN W L 61470
CASTRO J F 61897
CATENACCI G 61820
CAVALLERI A *61816
CEDERNA A *62369
CEVIDALLI G *62689
CHALKER W R *62733
CHALLIS E J *62281
CHAMPAGNE J *62240
CHANCE B 61469
CHANG C W *62180
CHAPLIN J F 62030
CHAPMAN J S *61916
CHAPMAN R *61733
CHARLES J M *61459
CHARLESWORTH F A *61460
CHARPIN J *61461
CHEN R W *61462
CHENG M S 62233
CHEREMISINOFF P N 61778
CHERNOMORSKIY A R 61549
CHERNYSHOVA L V 62198
CHI C T *62241
CHIKOS P M 61908
CHOW C K 61470
CHRISTOPH B 61812
CHUJO E *61356
CHUNG A M 62258
CICHON R 61679
CIKRT M *61463
CIRILLO R R *62335
CLAEYS F 61813
CLARENBURG L A *62770
CLARK B R *62336
CLARKE A J 62791
CLAYSON D B 61856
CLAYSON R L *62782
CLAYTON J W JR *61734
CLEMENTS J B *62370
CLEMMENSEN J *61735
COBB J C *62312
COE J 62636
COFFIN D 61478
COFFIN D L 61497, 61685, 61686, 61687, 61688, 61689
COGSWELL J J *61464
COHEN N 61891
COLLIS R T H 62447
COLUCCI J M 62316
CONDE J *61736
CONNEY A H 61612
COOLEY P C 62263
COOPER H B H JR *62242
COOPER N L *62640
COTE R W 61776
COTTINI L 62219, 62222
COUDRAY P 61914
COUFAL K *61817
COX C B 62273
COX C C 61686
CRAIG D K *61989
CRAMER R S *62371
CRAWFORD M 61622
CREMEANS J E *62264
CRENSHAW J D *62337
CRISTIANI H *62204
CROLEY T E II 62233
CSINABY L *62372
CULVER B *61357
CURTI D R *62219
CURTIS S E *61990
CZERNIAK G *62373

D

D ALFONSO G *61737
DACH G *62232
DALE I M *61738
DALEY J C *62709
DALY G T *61991
DANBAYASHI H *61992, *61993
DANBAYASHI K *61994, *61995, *62137, *62138
DANIELS M J 61497
DANNER R M 61362
DATE N *61996, *61997, *61998
DAVIES C N *61818
DAVIES R J P *62374
DAVILA G H *62690
DAVYDOVA T B *61819
DAWES D 62695
DAY D L 61990
DE BOECK R 61813
DE CATALDIS G 61404
DE CORMIS L 61987
DE FALCO P JR *62375, *62376, *62377
DE JORGE F B *61904
DE PIERRO J N 62451
DECORFO J J 62209
DEFALCO P *62378
DEFALCO P JR *62379, *62380
DEHNEN W *61465
DELCARTE E *61999
DEMSITZ M 61739
DERMELJI M 61865
DERVAY J R II *62313
DESAEDELEER G G *61466
DEVITT T W 62358, *62381, *62382
DEWEES D N *62710
DHARMARAJAN V 62191
DHURANDHAR R 61885
DIMITRIADES B *62383
DINGELL J D *62734
DIXON J P *62771
DJURIC D *61467
DODGSON K S 61896
DODO E 61657
DODO H *61468
DOERRE W H 61508
DOLENSKY J 61679
DOLHOVA L H *62166
DOLL R *61905
DOLOVICH M 61695
DORA E *61469
DOUCE W C *62758
DOUGLASS O W JR 61553
DOWLER O L 62295
DOWNING P B *62384
DRESNACK R *62385
DREYHAUPT F J 61472, *62386
DRINKWATER B L 61491
DROZDZ M 61863, 61864
DUBA W C 61476
DUKE K M 62473
DUNGWORTH D L *61470
DUNLOP J T *62296
DUSBABEK K E 62109
DUTTON C B *62779
DYER R F *61358

E

EBATA R 61547, 61669
EBINE S 62158
EDELMAN S *62735
EDWARDS M E *62181
EFF H 61496
EHM W 61405
EHRLICH R *61471
EIMUTIS E C 62241
EINBRODT H J 61405, *61472, 61619, 61902
ELIKOFER J *61739
ELLIS R J *62387
EMERSON S 62174
EMMETT B *62243
ENDO R *61359, 61373, 61374, 61380, *61473
ENDO T 61651, 61652
ENGLISH 62662
ENVIRON HEALTH PERSPECT 61567
ERISMANN K H 62066
ERMENC E D *62388
ERNST G B *61474
ESCH V H 61358
ESCHNER E *61475
ETTEMA J H *61476
EVANS M J *61360
EXON J H *61477

F

FAHIM M S *61361
FAHIM Z 61361
FAIRCHILD G A *61478
FASSBENDER C P *61479
FAVINO A *61820
FAVRETTO L *62000
FEDER W A *62139
FEDERAL REGISTER 62519
FEKETENE NARAI K *62297
FELDHEIM W *62001
FENTERS J D 61471
FERIN J *61886
FERRAROTTI F *62389
FERREIRA L C G 61904
FERRIS B G JR 61825
FERRIS B JR *61821
FILATOVA V S *61918
FINCH R *62730
FINE S D *62390
FINELLI V N *61362
FINKLEA J 61733
FINKLEA J F 61455
FIORINA M P *62768
FISCH O *62391
FISCHER A B *61480
FISCHER D A 61500
FISCHER K *62140, *62182
FISCHNALLER M *61740
FISEROVA BERGEROVA V *62325
FISHER J L *62392
FISHER R 61545
FLAKS A *61856
FLEMING R J 62273
FLESH R D *62766
FLINN J E 62541
FLOREY C 61752
FOGARTY J E *62772
FOGEL M E 62263
FORMBY J R 62340

FOSTER C R *62393
FOSTER W M 61832
FRANZEN E *61481
FRAUMENI J F 61452
FRAUMENI J F JR *61482
FREEBURG L C 61768
FREEDMAN M L 61434
FREEMAN A M III *62265
FREEMAN G 61360
FREEMAN L R *62394, *62395
FREIGANG B 61812
FRENCH J 61733
FRENCH J G *62396
FREOUR P *61914
FREUDENTHAL R I *61483
FRI R M *62397
FRI R W *62322
FRIBERG I *61484
FRIBERG L *61485
FRIEHE W *62228
FRONGIA N *61741
FROST P G H 61871
FRUHMANN G *61486, *61742
FUCHI Y 62453
FUCHS R 61835
FUGAS M *61743
FUGASH M *62641
FUJII K 61529
FUJII M *61487, 61571
FUJIMOTO K *61488
FUJINO T 61571
FUJITA K 62123
FUJIWARA S 61841
FUJIWARA T *62002, *62003, *62004
FUKASE O 61379, *61489, 61519
FUKAYA K 61750
FUKUDA K *61887
FUKUDA M *61363, *61490, 61574
FUKUI S 61750, 62035
FUKUSHIMA E 61763
FUKUSHIMA Y 61378, 61971
FUKUTO T R *61926

G

GABRIELLI L F 62000
GALIMOV E M *62005
GALKIEWICZ R C 62510
GALLOPIN G 62648
GARDNER B W 62759
GARDNER D 61471
GARDNER D E 61497
GARDNER J W *62736
GARGANI G 62216
GARLAND H R 61685, 61689
GARREC J P *61927
GARRIDO J 61777
GAVRILOV Y I 62250
GEBHART J 61824
GEHRING P J 61507
GEISS F *62398
GEITNER N 62636
GELBOIN H B 61800
GELBOIN H V 61552
GENDELL D S 62711
GEORGE M E 61908
GERSTLE R W 62721
GIAQUINTA A R *62233
GIBSON R J W 61752
GILBERT O L *62006
GILBERTSON W E *62737
GILES F E *62141
GILES W S *62230
GILGEN A 61913
GIOVENALE F 62369
GLASS R I *62399
GLINER J A *61491
GODSCHALK D R *62400
GOETHERT M *61857
GOFMEKLER V A *61492
GOHLKE R 61630
GOLDBERG H 61733
GOLDBLOOM V C *62720
GOLDMAN S *61493
GOLDSMITH J R *61744, *61822
GOLDSTEIN B 61434
GOLDSTEIN B D *61494
GOLDSTEIN D H 61891
GOLDSTEIN E *61823
GOODMAN G T *61495
GOOTJES P *62401
GORDON P 61840
GORDON T 61619
GORDUS A A *61745
GOTO H *61364, 61429, 61593, 61650, 61672, 61702
GOTO S 61603
GOTTKEHASKAMP 62227
GRAB B 61766
GRAEF W *61496
GRAHAM J A *61497
GRANDJEAN E 61690, *61913
GRANDY D M 62566
GRANGER J M *62167
GRAOVAC LEPOSAVIC L 61467
GRAU J G 62141
GRAY B 62636
GRECZ N 61874
GREEN J A *62402, *62403, *62404
GREENBERG H 61502
GRIFFIN J M 62473
GRIGORESCU I *61917
GRIMAUD C *61498
GRISWOLD S S *62757
GROLL KNAPP E 61747
GRONSBERG Y S 61918
GROSS J 62648
GROSS P *61746
GUDERIAN R 62053
GULDBERG P H 62527
GUSEV M I 61790
GUSTAFSON S A *62691
GUTER K J 61872
GYLSETH B *61499

H

HACKNEY J C *61500
HACKNEY J D *61501, *61502
HADDOCK M P 61879
HADJDUK J 61984
HAENTZSCH S *62405
HAGEVIK G 62364, 62414, *62642
HAIDER M *61747
HALL D G 61361
HALLOCK D L 62052
HAMADA K 61964
HAMAMOTO J 62224
HAMAOKA R 62517
HAMBURG F C *62783
HAMILTON J M 61856
HAMMER R W *62406
HANEYAMA K 62171
HANSEN G 61735
HANSLER M M *62407
HANSMANN K *62338, *62408
HARADA F 62119
HARADA M 61410
HARAWITZ H 62414
HARDING J *62142
HARLOW R L *62643
HART F C *62644
HARTMANN H F *61858
HARUKI T 61421, 61660
HASE A *62409
HASEBE E 61391
HASEBE T *61928, 62016
HASHIMOTO S *61929, 61945, *62007
HASHIMOTO T *61504, *61505
HASHIZUME N 62220
HATADA K 61585
HATADA M 61603
HATTA H *61930, 61963, *62008, *62009, *62010, *62011, 62039, 62081, 62197
HATTORI J 61395
HATTORI M 61420
HATTORI S 61783
HAUN C C 61908
HAUSER T R *62410
HAUSKNECHT D F *61748, *61859
HAUSKRECHT I 62122
HAVAS P *62168
HAYAFUKU M 62708
HAYAKAWA S 62072
HAYASHI H *61506, 61524
HAYASHI K 61703
HAYNIE F 62214
HAYNIE F H *62208
HAYTHORNE R E *62645
HEDLEY W H 62241
HEFNER R E JR *61507
HEITNER K *62646
HENDRICKSON E R 62475
HENNING V *62411
HENZ D J *62721
HERZOG P *61365
HEUSS J M *62316
HEWITT D 61780
HEYDEN L V *62339
HEYDER B *61824
HEYWOOD J B *62412
HIDY G M 62637
HIGGINS I T T *61825
HIGGINSON N *62647
HIGUCHI F 61539, 61638, 61649, 61764
HIJIKATA F 61387
HILL G R *62797
HIMI Y 61550
HIRABAYASHI K 61664
HIRAGA K 61537
HIRAI G 62083, *62107
HIRAI T *62012, *62013
HIRANO K 61979
HIRAOKA E 61868
HIRATA H *62108
HIRATSUKA T *62014
HIRAYOSHI K 61520
HIRONO T 62708
HIRONO Y 61947
HIROSAWA 61841
HIROSE T 61391
HIROSE Y *61366
HIROTA J *61367
HOCHHEISER S 62568
HODGES G H 62147
HODGSON R H *62109
HOELLER H 61747
HOFFER B L 62109
HOFFMAN G J *62015
HOFFMAN W 62666
HOFFMANN D *61860, *61861
HOLBROOK D J JR *61368
HOLLAND E Z *62413
HOLLAND W W *61749
HOLLING C S *62648
HOLMES J *62692
HOLT P G 61781
HOLTZMAN R B *61888
HOMMA K *61369, *61370

HOMMA M 62108
HOMMA S 61954, 62197
HORI H 61506
HORIE Y 61947
HORIGUCHI Y *61371, *61750
HORN K *61508
HOROWITZ J *62649, 62692
HORVATH I 62122
HORVATH S M 61491, *61826
HOSKO M J 61842
HOSODA T 61868
HOWARD J E 62432
HOWELL R K 62034
HOWES R G *62773, *62774
HUBER E E 62349
HUETER *61751
HUGUET J H *62738
HULBERT A J 61802
HULL D 61464
HUMPHREY H H *62739
HUSSEY E T *62414
HUTTUNEN S 62168
HYODO K *61509

I

IACOBELLI R F *62415
ICHIHARA M 61882
ICHIKAWA I *61372, *61510, *61511
ICHIKAWA N 61928, *62016
IDOHARA M 61947
IIJIMA T 61997
IKAWA M *61512, 61556
IKEBE H 61571
IKEDA M *61513
IKEDA T 62078
IKEMATSU T *61373
IKEMATSU U 61416
IKEMI C 61587
ILCEWICZ F H 61888
ILLINSKIY I I 62670
ILTIS R 61692
IMABASHI K 61649
IMAGAWA C 61653
IMAGAWA U *61374
IMAI F 61982
IMAI M *61375, 61438, *61514, *61515, *61516, 61534, 61607
IMAI S *62017, *62018, 62086
IMAI T 62106
IMAMURA S *62110
IMPENS R 61999
INAGAKI I 62110
INGRAM M 62203
INOUE E *62019
INOUE H 61366
INOUE T 62111, 62169, *62298
INSOLERA I 62389
IRWIG 61751
IRWIG L *61752
ISAEV Y V 62115
ISHIBASHI R *62020
ISHIBE Y 61528
ISHIDA K *62416
ISHIDA T 61513
ISHIGURO F 62220
ISHIGURO T *62417
ISHII S *62111
ISHII T 61394
ISHIKAWA A 61418
ISHIKAWA H *61931, 61980
ISHIKAWA N 61868
ISHIKAWA S 61410, *61517
ISHIKAWA T 62080
ISHIMARU A 61979
ISHIMI A *61376, *61377
ISHINISHI N *61378
ISHINISHI S 61399, *61518, 61538, 61597, *61827
ISOMURA K *61379, 61489
ITAI K 61591, 61952, 62061, 62067
ITAYA K 61590
ITO K 61395, *62244
ITO M 62014, 62583
ITO N 62708
ITO S *62021
ITO T 62158
IVERACH D *62340
IWAI Y 61673
IWAKURA M 61395
IWAMOTO S 61581
IWAMOTO T *62341
IWAMURA E 61955
IWAMURA K *61519
IWASAKI A 61349
IZUMI S 61387
IZUMI T 61393, *61520
IZUMIKAWA S 62708

J

JACKSON D L *61753
JACOBI W 61833
JAENICKE M *62418
JAHR J 61499
JANDOVA D 61828
JANOCHA P *62419, *62420
JAVICOLI R 62389
JECH J *61889
JEFFERS J 62648
JENDYK M 61843
JENKINS C *62022
JENNETT J C 62580
JENSEN A H 61990
JENSEN C E *62421
JENSEN K F *62023, *62024
JERMINI C 61690
JIMESON R M *62272
JINNAI T *62422
JINNO K 61783
JOETTEN K W *61924
JOHANN H P *62423
JOHNSON E C 62709
JOHNSON L V 61360
JOHNSON W 62414
JOHNSTON D R 62263
JOLLEY K W 61614
JONES G 62636
JONES H C 61943
JONES I 62636
JONES W W *62207
JOZKIEWICZ S 61863, 61864
JUCHNOWSKI T A 62451
JURGENS R B *62424
JURICA Z 61890
JURKOWSKI D 61780

K

KADOTA M 62047, *62169, *62170, 62189
KAGAWA J *61521, 61662, *61754
KAHL D 62465
KAJIKAWA S 62059
KAKIMOTO H 62224
KAKUTANI N *62025
KALINOVSHAJA L P 61450
KALPAZANOV J *61522
KAMADA T 62017
KAMAYAMA H *61523
KAMIHIRA M *62026
KAMINSKI K 61838
KAMIYA N 61537
KAMIYAMA N *61524
KAMIYAMA O 62171
KAMIYAMA S *61525
KAMYNINA L N 61492
KANAI H *62112
KANDA K *62299
KANDUS J *61890
KANE P 61478
KANEKO M 61550, 61979
KANTAWALA D C *62425
KAPITANOV Y T 62318
KARAFFA M 61362
KARAN P P 62760
KARASAWA M *62426
KARHAUSEN 61751
KARNOSKY D F *62113
KARPENKO V N 61773
KARR M H 62636
KARUZA S K 61500, 61502
KASAHARA M *62427
KASASSOW P *61755
KASEMIR H *61756
KASSEBART V 61779
KASSOFF H *62711
KASTKA J 61693
KASUGA N *62428
KATAGIRI Y 61382, *61526
KATAYAMA A *61527
KATAYAMA H 61653
KATO H *62220
KATO M *61528
KATO T *62429, *62693
KAW J L 61594
KAWABATA R 61783
KAWADA I 62076
KAWAGUCHI N 61527
KAWAHISA Y 61868
KAWAI H *61380, 61651, 61652, 61653
KAWAI K *61381, *61529
KAWAI M *61382, 61526
KAWAKAMI K 62221
KAWAKAMI M 61366, 61633, *61757
KAWAKAMI Y 61439
KAWAMATA M *61932
KAWAMOTO N 61699
KAWANAKA T 62220
KAWARAYA T *61383, 61421, 61660
KAWASAKI M *61530
KAWECKA A *62143
KAZENASHEV V F 61554
KAZUE S 62120
KEAST D 61781
KEKKI HELLMAN A *61531
KELLER M D 61776
KELLEY K W 61990
KELLY G 62634
KENDER W J *62144
KENTON C *61758
KERNER O *62740
KERP L 61756
KERR H D *61532
KERTESZNE SARINGER M 62565
KIFUJI H 62020
KIKUCHI K *61759
KILBURN K H *61760
KIMBROUGH R D *61761
KIMURA I *61533, 62067
KINITAKE E 61538
KIRCHMANN R 62136
KISHINO N 61509
KITABATAKE M 61375, *61384, *61385, 61438, 61514, 61515, *61534, *61535
KITABAYASHI M 61516
KITAMAURA F *61933
KITAMURA F *61934
KIYASU M 61967

KJELLSTROM T 61485
KLEEREKOPER L 61476
KLEIN D A 62065
KLEIN J A 62246
KLEISBAUER J P 61786
KLEPPER B L 61989
KLIMKOVA DEUTSCHOVA E *61828
KNEIP 62662
KNEIP T J *61891
KNELSON 61751
KNELSON J H *61536, 61646, *61762
KNIGHT A R *62211
KOBAYAKAWA T *62430
KOBAYASHI H *61537
KOBAYASHI S 62453
KOBE M 61868
KOCH R B *61906
KOCHIS P C 62365
KODAMA Y 61378, 61518, *61538
KODOTA M *62183
KOEHLER R *61862
KOIKE T 61959
KOIWAI K *61763
KOKUBU Y *62027
KOLLER K *62431
KOLLER L D 61477
KOMAI Y *62171, *62184
KOMATSU G *61539, *61764
KOMITOWSKI D *61540
KON M 61633
KONDO H 61406, 62158
KONGSHAUG H *62212
KONHEIM B B *62775
KONIETZKO N 61579
KONNO K *61386
KONO K *61541
KOPP C *62114
KOPPLE J 61787
KORTANEK K O 62691
KOSMIDER S *61829, *61863, *61864
KOSTA L *61765, *61865
KOSYUKINA Z T 62166
KOTAKE Y *61542
KOUTSANDREAS J D *62694
KOVACH A G B 61469
KOWALSKI Z *62317
KOYAMA Y 61582
KOZIARA E C 62258
KOZLOWSKI R G *62432
KOZLOWSKI T T 62024
KRAMER D 62140
KRASOVITSKAYA M L *61866
KRCHNAKOVA J 61817
KREKELER H 61835
KREMER G *62433, *62434
KRIER J E 62646, *62650, *62695
KRIVOPISHIN I P *62115
KRUMM A A 61855
KUBO M 61423, 61424, 61425
KUBOTA H *61543
KUDO S *61544, 61575
KUGEL G *62651
KUHRTZ S 62649
KULETA M 62122
KULLE T J 61532
KULLER L H *61545
KULUJIAN N J 62358, 62381, 62382, *62435
KUMAGAYA M *61387
KUMAZAWA Y *61546, *62436
KUMMER H N 62273
KUMPF 61751
KUMPF J *61766
KUNII K 62058
KUNISATO H *61547
KUNITAKE E 61378
KUO C H 62337
KURAMOTO Y *62437
KURATA A *61548, 61602
KURIBAYASHI S *62116, *62145, *62185, *62186, *62187, *62188, *62189
KURIHARA S 61998
KURLYANDSKIY B A *61549
KURODA S 61877
KUROKAWA M *61550
KUROKAWA Y 61783
KURTSCHATOVA G 61522
KUSAKA S 61981, 61982, 62106
KUSTOV V V 61809
KUSUMOTO H 61425
KUSUMOTO S *61388, 61423, 61424, *61551, 61598, 61602, 61782
KUTSCHEIDT E 62433
KUZ MINA L F 62217

L

LAAMANEN A *62722
LABELLE S J 62576
LAFONTAINE A 61813
LAMM L P *62438
LANESE R R 61776
LARRABEE C P *62231
LARSEN R I *62329
LARSON C M *62723
LATALA A *62245
LAUER G *62652
LAUER K H *62342
LAUWERYS R *61767
LAVAL P 61786
LAVE L B *61768
LAW D C 61500, 61502
LAWTHER P J *61830
LAZAROVA H 61676
LEBEDEV V G 62250
LEBZELTERN H *62343
LEDBETTER J O *62762
LEE D R *62439
LEE R E JR 61536
LEE S D 61362
LEEDER S R *61769
LEES L 62695
LEGRO S W *62300, *62440, *62441, *62442, *62443, *62444, *62445, *62446
LEHMANN A 62465, *62696
LENGGENHAGER K *61831
LENIHAN J M A 61738
LESOURD D A 62263
LEUNG K C *62246
LEUSCHNER R M *61770
LEUTZ J C *61552
LEVAGGI D 62414
LEVIN W 61612
LEVY J 61828
LEVY P 61454
LEWIS D H 62631
LEWIS H R *62776
LEWIS N E *62209
LHOSTE A M 61927
LIBERTI A *62653
LIDDLE C G 61355
LIEBERMAN D 62414
LIEVANO R J 62257
LIKHACHEV Y P *61771
LINDER R E 61761
LINDVALL T 62765
LINN W S 61500, 61501, 61502
LINSKY B *62285, *62755
LINZON S N *62190
LIPETZ J *61553
LIPPMAN M 61898
LIPPMANN M *61832
LISHCHINSKIY B D 61492
LITVINOV N N *61554
LIVSHITZ G S 61642
LIVSHITZ V M *61921
LOUGUET P 61987
LOVE G J *61772
LOW R A *62741
LUCAS D H 62791
LUCIAK M 61863, 61864
LUDWIG F L *62447
LUDYGA K 61863, 61864
LUETTGE U 62182
LUGOVOY V S *61555
LUSIS G 61885
LUTZ G A 61483
LYARSKIY P P *62318

M

MAAS E V 62015
MABUCHI Y 61512, *61556
MACEWEN J D 61908
MACKENZIE W F 61908
MACKOVA O *61557
MACLEOD S *62654
MAEDA C 61994
MAEDA S 61366, 61757
MAEDA T 61581
MAEDLER R *62448
MAEJIMA K *61558
MAENO M 61955, 62025, 62127
MAERTENS A *61833
MAESHIMA K *61559
MAGA J A *62330
MAHAJAN K K *62784
MAHER C C III 61745
MAHOLTRA R 62266
MAHONEY J R *62724
MAIER P E *61560
MAIGETTER R 61471
MAJOR R L *62266
MAKINO K *61389, *61561, *61562
MALACNHUK M 61362
MALENKIJ W P *61563
MALKOVA V 61676
MALMBERG K B *62449, *62450
MALYAROVA L K 61866
MAMMARELLA L *62282
MANDEL J S 61780
MANDELKER D R 62364, 62414, *62655
MANEGOLD G 61869
MARCHESANI V J *62451
MARGESON J H 62370
MARHOLD J *62326, *62327, *62328
MARIENFELD C J *61892
MARLETTA G P 62000
MARTENS D C 62052
MARTIN C G *62763
MARTIN W 62196
MARTINEZ J D *62191
MARUYA H *61564, *61565, *61566
MASHIKO Y 62158
MASON T J *61567
MASSER C C *62452
MASTERS R G 62023
MASUDA T 62453
MASUI Y 62072
MASUJIMA H *61935
MATOKHNYUK L A *61773
MATSUBARA S *61390
MATSUDA M *62453
MATSUI T *61936, *61937
MATSUMARU T 61941, 62073, *62096, 62117
MATSUMOTO H 62079
MATSUNAKA S *61938
MATSUNAKA T *61939
MATSUNAMI M *62454

MATSUNO M 61506, 61558, 61559
MATSUO K 62060
MATSUOKA Y *61940, *61941, 61944, 62033, 62073, 62096, *62117, *62192
MATSUSHIMA A 61699, *62455
MATSUSHIMA F *62028
MATSUSHITA T *61568
MATSUTANI T 61624, 61625
MATSUZAKI N *62456
MATTHEWS W H *62457, *62458
MATTHYS H 61579
MATUSZEWSKI W 61838
MAURA M 62197
MAYNARD W S 62636
MAYUMI H 62089, 62090, 62091, 62092, 62094
MAYUMI Y *61942, *62029, *62172, *62193
MAZLIAK P *61774
MCCUNE D C *62146
MCCUTCHEN G D *62314
MCDEVITT T J *61834
MCGILL T 61643
MCGLENNON J A S *62344, *62459
MCILHANY M L 61532
MCINTIRE M S 61446
MCKEE C G 62147
MCKEE H C *62742
MCLAUGHLIN S B *61943
MCLEAN A E M *61867
MCLELLAN J S 61731
MCMILLAN L 61362
MCQUEARY M L 62365
MCRITCHIE R J *61775, 61844
MEAD R 62414
MEGURO S 61524
MEGURO T 61402
MELAMED M 61840
MELLICK P W 61470
MELVILLE J G 62233
MENSHIKOVA T A *61893
MENCEL S J *61569
MENSER H A *62030, *62147
MENZEL D B 61459
MEYERS S *62460, *62461
MICHIZUKI S *61570
MIDDLETON J T *62331
MIDDLETON S G 62141
MIDGETT M R 62370
MIDURSKI T P 62366, *62462
MIEDEMA A K 62263
MIFUDA S *61571
MIKAMI E 61648, 62088
MIKAMI R 61575
MIKAMI T *62463
MILIC S 61467
MILLER F J 61497, 61687
MILLER J M *62656
MILLS M T 62510
MILNER A D 61464
MIMURA H 61550
MINAKI K 61488
MINOHARA Y 62026
MIRABITO J A 62421
MISHENKOV N N 62148
MISIEWICZ A 61829, 61863, 61864
MISSEN R *62464
MITCHELL H C *62743
MITCHELL R I 61483, *61776
MITOBE H *61391
MITSUKI I 62036, 62037
MITSUNAGA K *61392
MITSUNUSA H 61420
MIYABE I *61572
MIYACHI H 61548
MIYAJI H 61602
MIYAJIMA F *61868
MIYAKE H 61887
MIYAKE Y *62118, *62173, 62176
MIYAMOTO S 62453
MIYAMOTO T 62131, 62236
MIYAMOTO Y *62031
MIYATA M 61410
MIYATAKE K *61573
MIYAWAKI H 61699
MIYAZAKI T 61571
MIYOSHI H 61581
MIYOSHI Y 61603
MIZOGUCHI I 61389, 61400, 61410, *61574, *61575, *61576
MIZUKOSHI N 61795
MIZUTA M 61925
MIZUTANI N 61395
MOCHIDA M *62194
MOCHIZUKI K 61415
MOGI K *62221
MOHLER J G 61501
MOHRY H *62465
MOISEYEV G E *61577
MOLL B J 62759
MONFORT K W 62273
MONGAN T R 62340
MONTELEONE P N 61908
MONTGOMERY R E JR *62466, *62467, *62468
MONTURIOL J M *61777
MOODIE S P 62249
MOODIE T W *61894
MOORE P D *62032
MORAN J B 61455
MORDELET DAMBRINE M 61647
MORGENSTERN P *62697
MORI M 61791
MORI S *61393, 61520
MORI T 61656
MORIKAWA K 61603
MORIKAWA M 61941, *61944, *62033, 62073, 62096, 62117
MORIMOTO S 61601
MORIMOTO T *61394
MORISE M *61395
MORIYA K 61699, *62119
MORRELL D 62414
MORRESI A C *61778
MORRIS A R *62469, *62470
MORRISON D L *62471
MOSCHEKOV K 62226
MOTE L B 62241
MOTOMIYA T 61349, *61396, *61578, 61703
MUCHMORE E A S 61891
MUELLER M *61579
MUKAI I *61580
MULVIHILL J W *62287
MUNDT W *61779
MURABAYASHI H 61638, 61649
MURAI M 61349
MURAKAMI H 62079
MURAKAMI I 61882
MURAKAMI K *61581
MURAMATSU S *62657
MURAYAMA H 61798
MURAYAMA N *61582
MURPHY R P *62472
MURRY J J *62034
MURTHY V K *61397
MUSKIE E S *62793
MUSTAFA M G 61470
MYOJO S 61783

N

NABESHIMA Y 61783
NAGAHASHI S 61418
NAGAOKA S 61373, 61374, 61429, 61430, 61593, 61650, 61672, 61702, *61895
NAGASAKI M 61400, 61578
NAGASHIMA C 61400
NAGASHIMA S 61366
NAGATA M *61583
NAGATA R 62708
NAGATA S *615[illegible]
NAGAYAMA Y 61759
NAGDA N L 61353
NAGIRA T *61585
NAGUMO K *61586
NAKADA M *62035
NAKAGAWA S *61587
NAKAGAWA Y *62036, *62037
NAKAJIMA I *62698
NAKAJIMA K 61661
NAKAJIMA S *62038
NAKAJIMA T 61400, 61546, 61601, 61602, *62039, *62301
NAKAJIMA Y 61423, 61424, 61425, 61548, 61551, 61598, 61782, *62040, *62041, *62120
NAKAMURA H 61910, *61945, *62042
NAKAMURA I *61588, 61654
NAKAMURA T *61398, 61624, 61625, 61656, 62007
NAKANO K 62708
NAKASHIMA C 61399
NAKASHIMA T 61841
NAKATSUGI T *61589
NAKAYA S *61590, *61591, 62061, 62067
NAKAYAMA M 61949
NAKAYAMA N *61592, 61669, 61670
NAKAZA M 61521, 61754
NAKAZAWA S 61429, *61593, 61650, 61672, 61969, *62043
NAMIE K 61359, 61653
NANGNIOT P 61999
NARANG S *61594
NARYSHKIN M A *62148
NASH T H III *62044, *62121
NATARAJAN K 62050
NATHANY M 62191
NATL LAND USE PLANN TRANS 62642
NAVARA J *62122
NEALEY S M 62636
NEBEL G J 62316
NEHMAN G I *62473
NEILSON A 61691
NELSON G *62744
NELSON N *61595
NELSON W L *62247
NERI L C *61780
NEUBERGER M 61747
NEWHOUSE M T 61695
NEWILL V A 61753, *62764
NEWTON P E 61842
NEY W *62248
NGOGAMI H 61602
NICKLIN D J *62249
NIEDING G V *61835
NIELSEN A 61735
NIELSEN N J 62340
NIKIFOROW B 61755
NIKOFOROWA J *61596
NISHI Y 61936, 61937
NISHIMOTO T *62123
NISHINARI T 61387
NISHIWAKI N 61395
NISHIYAMA S 61550, 61979
NITSCHE W *62474
NITTA Y 61349
NOBEL P S *62149
NOBUTOMO K 61378, *61399, 61518, *61597
NOGAMI H 61548, 61551, *61598, 61601, 61782

NOIRI I 61418
NOMA N *62288
NOMURA S 61568
NOMURA Y 61473
NORDBERG G 61484, 61485
NORDBERG G F 61686
NOREN S 62634
NORMAN A P 61464
NORPOTH K *61869
NORTON R L 62365
NORTON S 61357
NOSE Y 61488
NOTO A 61387
NOUCHI I *61946, 62028, *62045, 62063
NOUSHI H *61400
NOZE K 61581
NUKADA A 61377, *61401
NUKADA Y 61543, *61599
NULSEN A *61781
NUNO Y 61783

O

O CONNOR J A *62046
O NEILL J K 62255
OBLISAMI G 62050
OCHIAI S 61697, 62025
OCHS H J *61600
ODA H 61548, 61551, 61598, *61601, *61602, *61782
ODA Y *61947
ODAIRA T 61946, 61997, 62028, 62045
OELSCHLAEGER W *62150
OGATA M 61513
OGAWA K 62197
OGAWA M 61583
OGAWA S 62120
OGAWA T 61980, 62026
OGIHARA A 61649, 61764
OGIHARA S 61539
OGIMA I 61877
OGISHIMA K 61418
OGIWARA A 61638
OGIWARA M *62124
OGIWARA Y 62120
OGLESBY S *62475
OHASHI T 61946, 61997, 62045
OHIRA M 61585
OHIRA T 62708, *62712
OHMORI K 61882
OHMURA K 61882
OHNO T 62192
OHSUMI N 62538
OHTA H *62047, *62048
OHYAMA M *61603
OIZUMI K 61386
OKA M 61421, 61660
OKADA A 61887
OKADA S *62476
OKAMOTO T *61402
OKANO K 62083
OKAWADA N 61574
OKINO H 61945, *61948, 61949, 62110
OKINO T 61389, 61406
OKUMURA T *61604
OKURA H *61403
OKUYA H *61605
OLEFIR A I 61773
OMORI K 61663, 61697, *61910
OMOTO M 61377
ONISHI T 61783
ONO S 61418
ONO T 62073
OODAIRA T 62063
OOHASHI T 62063
OREHEK J 61461
ORESHKEVICH I V 61918
ORIDE K *62477
ORTMAN G C 62396
OSAWA M 61574
OSAWA S *61606
OSETO M 61791
OSHIMA H 61375, 61514, 61515, 61516, *61607
OSHIMA S *61608
OSHIMA T 62038, 62043
OSHINA T 61877
OSHIO Y 61415, 61416, 61422
OSWALD R L *62478
OTA K 62170
OTA Y 61929, 61945, 61948, *61949, *61950, 62007
OTANI A *62125
OTSUKA T 62221
OTT H 62398
OTT W R 62540
OTTONE C *62222
OWADA K 61356
OYAMA N *62049
OZAKI K *61783

P

PACK M R *61951
PADDOCK R E 62263
PAHLICH E *62151
PALEY L R *62479
PALKA O 61817
PALME W *61609
PANAGIOTAKOPOULOS D *62480
PANASIEWICZ M 61839
PANKOW D *61784, *61836
PANTCHEVA M 62226
PARBERY D G 62046
PARKER F H 62400
PARKER N 62636
PARROT J L 61647
PARTHASARATHY S *62050
PARTSEF D P 61549
PASIEWICZ J 61863, 61864
PATEL V C 62233
PATTERSON R M 62462, 62510, 62511
PAVLOVSKAYA N A 62318
PAYER H D *62051
PEAT J K 61769
PEDERSEN E E 61500, 61501, 61502
PELL E J *62126
PENG T H 62174
PENLEY R 61646
PENNEY D G *61785
PERKOWSKI J C 62458, 62516
PERMUTT S 61628
PERPER J A 61545
PERSSON G A *62481
PETERSON E *62777
PETERSON H T JR 61832
PETERSON J E *61610, 61842
PETRAGLIA A *61404
PETRENCHUK O P *62223
PETRIE J H 62398
PEYTCHEV L *62226
PFANNENSTIEL R J 62451
PFETZER C T 61692
PHALEN R F 61802
PHAM 62662
PHILLIPS G C 61674
PHILLIPS W J *62745
PIANKO M *62482
PICCINATO L 62369
PIERZCHALA W 61839
PILET P E *61611
PINDEV G 62226
PINIGIN N A 62319
PIOT J C M *62787
PISCATOR M 61484, 61485
PISUT I *62195
PLANK C O *62052
PODDUBNAYA L T 61809
POEHLS H *62483
POIRIER R *61786
POLLACK S V 61873
PONSOLD W 61784, 61836
PONTUALE L 62389
POPPERS P J *61612
PORTER E F JR *62794
POSTON H W *62725
POTTER J D 62337
PRASCA G 62389
PREDA M *62699
PRESSEL G *61870
PRINDLE R A *62332
PRINZ B *62053
PROCTOR P D *62790
PROKHORO V B 62250
PROKOP EVA A S *61837
PRZBYLOWSKI J *61838
PRZYBYLOWSKI J *61839

Q

QUARLES J *62484, *62485, *62486, *62487, *62488, *62489, *62490, *62491, *62492, *62493, *62494, *62495, *62496, *62497, *62498, *62499, *62500, *62501, *62502, *62503, *62504, *62505, *62506, *62507

R

RAABE O G 61802
RABINOVICH J 62648
RABINOWITZ M *61787
RADFORD E P 61545, *61613
RADUJ L 62431
RAGUIN J *62729
RAMUNDO L P 61897
RANGASWAMI G 62050
RANKIN J W 62645
RAUTER W *62054
RAVAN J C *62508
RAVAN J E *62509
RAVEN P B 61491
RAVNIK V 61865
RAWLINS S L 62015
RECORD F *62510
RECORD F A *62511
REDELINGHUYS E P 61871
REED B L 61799
REED C W 62209
REEVES R D *61614
REICHEL G *61615
REID R 62692
RENDIC D 61674
RENEKER R W *62273
RENES L E *61616
REPLOH H 61924
REUSS J O *62055
REYNOLDS S D *62512
RHOADS A F *62056
RHODES R C 62568
RICHARD C *62513
RICHARDS R J *61896
RIETHMANN H *62780
RIGANTI V 62219
RIHM A JR *62746
RIKHTER L A *62250
RITSCHEL O *62514
RIVERO O *61617

ROBBINS M L *62152
ROBERT K H 61484
ROBERTS J J *62658
ROBERTSON D 61814
ROBERTSON J E *62267
ROBOCK K *61788
RODERICK H *61618
RODRIQUEZ ALARCON Y FERNA *61897
ROHMEDER E *62201
ROJEL J 61735
ROMNEY E M 62177
ROSE T H *62515
ROSEN P *61840
ROSENKRANZ R D *62234
ROSENTHAL A J 62542
ROSMAN J 61434
ROSMANITH J *61405, 61472, *61619, *61620
ROSS F F *62791
ROSS S S *62713
ROSSANO A T JR *62747
ROSSMAN C M 61695
ROTH J *61621
ROUSSEL A *61789
ROYSTON M G *62516
RUCKELSHAUS W D *62323, *62324, *62726
RUIZ ZUBERO J 61777
RUMMEL R M *61622
RUPPEL R 61779
RUSSELL C S *62213
RUSSO A 61501
RUTHERFORD G S 62253
RYZHOVSKII V L *61790

S

SAEKI M *62057, *62058
SAIKAWA M *62059
SAIKI Y 61550
SAITA M 62083
SAITO H 61373, *62517
SAITO K *61406
SAITO S 61962
SAKAGUCHI K *61623
SAKAI S 61983
SAKAI Y *61624, *61625
SAKAN M 61488
SAKATA T 61795
SAKAYORI M *62518
SAKIHARA K *62060
SAKUMA J 61389
SAKURAI S 61414, 61590, 61591, *61952, *62061, *62062, 62067
SALCMANOVA Z 61828
SALEH M A 62157
SALVAGGIO J 61691
SALZANO E 62369
SAMPSON A F *62519
SANCHEZ D *62520
SANDER H P *62345
SANO H *62251, *62252
SANO I 62047
SANOTSKIY I V *61923
SARDI G 62431
SARUTA K 61649
SASAKI K *61407
SASAKI T 61366
SATAKE T *61626
SATO A *61841, 61971, 62220
SATO K 61877
SATO M 61571
SATO S 61366, 61750, 61757, 62017
SATO T 61966, 61967, 61968
SATO Y 61648, 62067, 62088
SATOH K 61568
SAVINO A 61840
SAWADA T 61946, 61997, 62028, 62045, *62063
SAWICKI E *61627
SAWYER B 62240
SAWYER J 62196
SCARANO L 61737
SCARDINO C A *62253
SCHARF S M *61628
SCHAUB S A 61792, 61872
SCHELLMAN B *61629
SCHINDLER D W *62174
SCHLESINGER R B *61898
SCHMIDT 61751
SCHMIDT G 62232
SCHMIDT P *61630
SCHMITT A *62521
SCHNEIDER A M *62274
SCHNEIDER H W *62781
SCHOFER J L *62659
SCHORMAIR S 61496
SCHORN V J 61943
SCHORR D *62795
SCHRAMEL M *62064
SCHROEDER A 61472
SCHROEDER S W *62660
SCHRUNK T D *62748
SCHUCK E A *62153
SCHUENEMANN J *62661
SCHUETZ M 62571
SCHULZE R H *62522
SCHUPHAN W *62789
SCHWABE C W *62196
SCHWARZ H E 62433
SCHWARZOVA K 61828
SCOTT R L 62287
SEDMAN C B *62523
SEELIG R P *62749
SEGALL A 61354
SEGEL F A 62273
SEIDERS T M 62294, 62361
SEINFELD J H 62512
SEKI H *61408
SEKI T 62058, *62254
SEMLING H V JR *62714
SERA K *62224
SERIZAWA S *61631, 61664
SERKIES J J 62451
SETO H *61632
SETO K *61633
SETTLE J E JR *62700
SEVERS R K *61634
SHABAD L M *62302
SHAMEL R E *62255
SHANDALA M G *61635
SHATOKHIN V *62785
SHATSKAYA R M 62198
SHAULIS N J 62144
SHAW C A *62701
SHEARER S D 62410
SHELINE J *61953
SHERRY T A 62364
SHERWOOD 62662
SHETTIGARA P T *61636
SHIGEKATSU H *61954
SHIGEMATSU H *62197
SHIGEMITSU K *62303
SHIGETA Y *62304, *62524
SHIKANO S 61517
SHIMADA S 61673
SHIMADA T 61750
SHIMANUKI M *62525
SHIMAZU Y 62648
SHIMIZU H *61409, 61448
SHIMIZU K *61410
SHIMIZU M 61473
SHIMIZU S 61529
SHIMIZU T *61411, *61637
SHIMONO S *62526
SHIMURA S 61366
SHINOZAKI M *61955, *62127, *62128
SHIOI H 62067
SHIOMI M 62197
SHIOZAWA A 62517
SHIRAISHI K 61783
SHIRATORI K 61941, 62073
SHIRATORI T 61944, 62033, 62117
SHISHIDO M 61539, 61633, *61638, 61649, 61764
SHUGLA T M *61639
SIDDIQI I 62156
SIDORENKO G I *61640, *62319
SIEGEL R D *62527
SIEGFRIED W R *61871
SIEMON G *61641
SILER O W *62528
SILVASI J 62520
SILVER I A 61469
SILVERSTEIN E 61471
SIMMONS D H 61458
SIMMONS W *62529
SIMON J 61990
SIMONS M JR 62263
SIMS P 61856
SKOGEN J D 61906
SMIRNOVA N A 61918
SMITH A E 62335
SMITH C JR *62530
SMITH C V *62531
SMITH H 61738
SMULEVICH V B *61642
SNYDER D J III *62532, *62533
SNYDER K 62200
SNYDER R E *62534
SODA K *61791
SOEDER C J 62051
SOKOL R A *62065
SOLINSKI P *62154
SOOLMAN A J 62462
SORBER C A *61792, *61872
SORENSEN S 61735
SORENSON G W 62280
SOUTHERLAND J H *62346
SPECHT H 61742
SPENCE J W 62208, *62214
SPINAZZOLA A 61741
STAHLHOFEN W 61824
STAIRMAND C J *62283
STAIRS G R 62113
STAMENOVA M 61522
STANISAVLIEVICI L *62215
STANLEY W J *62750
STAPLETON C R *62535
STAROSTIN V 62785
STAUSS W *62728
STEAD A G 61688
STEAD F M *62333
STEELE J 62648
STEENSBERG 62662
STEENSBERG J 61735
STEGNAR P 61865
STEHLING K 62634
STEIN A 62464
STELL P M *61643
STELTE W 62001
STEPHENS R J 61360
STEPHENSON E J *62536
STERLING T D *61873
STERN A C *62305
STERN P M *62751
STEVENSON W H *62347
STEWART R D 61610, *61644, *61842
STEWART W H *62796
STIDL H 61747
STITES J G JR *62752

STOECKLI B *62066
STOEFEN D *61645, *61922
STOLPMAN P 62692
STRAUSS W 62046
STRELOW R *62306, *62348, *62537
STRIETER R 62634
STRONG A A *61646
STULOVA Y A 61918
STUPFEL M *61647
SUDA B *62067
SUESS M J 61766
SUGAI R 61877, *62068
SUGANO S 61550, 61750, 62035
SUGANO T 61962, 62078
SUGAYA B 62078
SUGENO Y 62072
SUGI Y 62020
SUGIMAE A 62060
SUGIMOTO E *62069
SUGINO M *62070
SUGITA T 61539, 61633, 61638, 61649, 61764
SUGIURA K *61412, *62071
SUGIYAMA H 62197
SUKEDA Y *61648
SUKEGAWA N *61649
SUKETA Y *62072, 62087, 62088
SUKOVA M 61679
SULZBACH C W 61951
SUSSMAN V *62334
SUTTON J C 61491
SUZUKI H 61387
SUZUKI J B *61874
SUZUKI K *61956
SUZUKI S 61509, *61793
SUZUKI T 61415, 61422, 61429, 61593, *61650, 61672, 61793, 62057, 62058, *62538
SUZUKI U *61413
SUZUKI Y *61414, 61590, 61591, 62067
SWAIN R E *62205
SWARBRICK R E 61986
SWIDERSKY P 61532
SWIECICKI W *61843
SWIFT D 61545
SWYNGEDOUW Y 61813
SYOJI K 61603
SYROTA *62662
SYROTA M J *62715
SZADKOWSKI D 61779
SZYGULA J 61863, 61864

T

TABERSHAW I R *61875
TACHIBANA T 61571
TACHIKI T 61398
TAIRA K 61393
TAJIMA H 61387
TAKAC L 61677
TAKADA I 61406
TAKADA T 62037
TAKAGI K 61435
TAKAHASHI O 61882
TAKAHASHI R 61400
TAKAHASHI T 61633, 61750, 61941
TAKAMATSU A 61581
TAKANASHI N 62118
TAKANOU O 61395
TAKAO K 61928, 62016
TAKAOKA T 62036
TAKASAKI S 61420
TAKASAKI T 61944, 62033, *62073, 62117, 62192
TAKAYAMA O *61415, *61416, 61422
TAKEHARA S 61406
TAKEMOTO K 61359, 61380, *61417, *61651, *61652, *61653
TAKEMURA Y 61795
TAKENAGA H 62108
TAKEO K *61418
TAKEUCHI S 61673
TAKHIROV M T *61876
TAKISHIMA T 61366, 61757
TAKIZAWA Y 61588, *61654, *61655, *61877
TALLEY W K *62539
TANABE T 61473
TANAKA A *61656, 62183
TANAKA K 61473
TANAKA M *61657
TANAKA Y 61992, 61993, 61995
TANIGUCHI T 61603
TANIYA M 61783
TANIYAMA T *61957, *61958, *61959, *61960, *61961, *62074, *62075, *62076, *62129, *62130, *62155
TANIZAKI A 61910
TANIZAWA Y *61419
TAODA H *62077
TARABRIN V P *62198
TARANTINO O 61404
TARKINGTON B 61470
TASCHENBERG E F 62144
TASNADI G 62431
TATE M 61382, *61658
TATEKAWA H *61962, *62078
TATSUMI S *62079, *62080
TAUSHAN M D *61659
TAYLOR B 61464
TAZAKI T 61971
TERAKADO 62011
TERAKADO K 61930, *61963, 61997, 62008, 62009, 62010, 62039, *62081
TERANISHI K *61964
TERAO H 61389
TERAUSHI Y *61420
TERRIS B J *62663
TEVIS G P *62256
THAYER H E *62753
THOM G C *62540
THOMAS A A 61908
THOMAS M D 62797
THOMAS T J *62541
THOMPSON M *62664
THOMPSON R G *62257
THOMSON G *62225
THORNTON A S 62451
THORP R H 61569
THORP W 62373
THORPE J J *61878
THUILLIER R 62414
TIANO P *62216
TIETENBERG T *62542
TIHANSKY D P *62277
TILBERY C P 61904
TILMAN J 61999
TIMBRELL V *61907
TITMAN O 61828
TOBA G 61917
TOELG G *62543
TOGEDA H *61965
TOHI K 62014
TOISHI S *62702
TOMINAGA Y *62131
TOMITA K *61421, *61660
TONOKURA K *61661
TORIUMI H 61382
TOSAKA A *61422
TOSEROVA D 61679
TOUSTRUP J 61735
TOYAMA M 62197
TOYAMA T 61521, *61662, 61754
TOYODA M *62175
TOYODA Y *61423, *61424, *61425
TOYOTA H 61783
TOZAWA T *61663, 61697
TRAIN R E *62544, *62545, *62546, *62547, *62548, *62549, *62550, *62551, *62552, *62553, *62554, *62555, *62556, *62557, *62558, *62559, *62560, *62561, *62562
TRETTER V J 62242
TRIBBLE G L III 62759
TRUHAUT R *61794
TRUSOVA V N *62217
TSCHANZ T F 62335
TSUBOTA T 62013
TSUBOTA Y 61551, 61598, 61601, 61602
TSUDA M 61604, 61795
TSUJI J *62082
TSUJI K 61436, 61437
TSUJI T *61426, 61583
TSUKAMOTO C *61664
TSUKAYA T 62303
TSUNETOSHI Y 61547, 61592, 61604, *61665, *61666, *61667, 61669, 61670, 61795, *62083
TSUNO Y *61966, *61967, *61968
TSUNODA F 61414, *61427, 61590, 61591, *61668, 61700, 61952, 62061, 62067
TSURUIZUMI A 62047
TUJITANI T 62251
TUKEY J W *62754
TUNYSOVA V 61676, 61679
TURK A 62766
TYLER W S 61470

U

UBASHEEV I O 61837
UCHIYAMA T *61428
UDAGAWA O 62192
UEDA A 61568
UEDA M 61592, *61669, *61670
UEDA Y 62220
UEHARA A *62307
UEKI H *61969
UEOKA N 61564
UESHIMA I *61793
ULMER W T *61671
ULRICH B *62084
ULRICH C E *61879
UMEDA M *61429, 61593, 61650, *61672
UMEZAWA T 62002, 62003
UMIKITA J 62175
UMLAUF G E *62563
UNO Y 62118, 62173, *62176
UPDIKE S H 62230
UPHAM J B 62208
UPHAM J P 62214
URBANKOVA G 61677
USEMANN K W *62564
USHIJIMA S *61673
USHIJIMA T *61970, *61971
USUDA T 61656
UTAGAWA M 62712
UZUNER A S 62233

V

VALIC F 61743
VALKOVIC V *61674
VAN DER MERWE R P 61871
VAN DUUREN B L *61675
VAN HOOK R I *62349
VANNUCCI S 62216
VARKONYI T *62565
VARS R C *62280
VAS K *62203
VASILJEVA I A 61450

VAUGHAN T O 61686, 61687, 61688, 61689
VEIGELE W J 62782
VENTURINI P D *62566
VERMA A 62211
VERNOT E H *61908
VERZILLI A G 62258
VIRCHOW C 61770
VITALE W V *62567
VLC Z 61557, *61676
VLCHEVA V 61847
VLCKOVA A *61677
VOLKOV E P 62250
VON LEHMDEN D J *62568
VORONTSOV R S 61771
VORWERK W *62569
VOUK 62662
VOUK V B *61678
VRACHEBNOE DELO KIEV 61659
VYSLOUZIL Z *61679

W

WADA H 61750
WADA O 61418, *61430, *61431
WAFELMAN H R *62665
WAGNER J C *61919
WAGNER K H *62156
WAGONER J K 61455
WAKISAKA I *61432, *61680
WALDRON H A *61681, *61682
WALKER E A *62778
WALLACE A *62177
WALLER J G *62570
WALLER R E *61796, *61909
WALSH G W *62315
WALTON W H *61797
WANG C T 62149
WARD E P V 62510
WARD R B *61683
WATANABE C 61436, 61437
WATANABE H 61379, 61392, 61489, 61519, *61684, *61798, 61964
WATANABE K 61783
WATANABE P G 61507
WATANABE T 62129, 62130
WATANABE Y 61877
WATANUKI T 62119
WATERS M D *61685, *61686, *61687, *61688, *61689
WATT P C *62666
WEBER A *61690
WEBER E *62571
WEBER R 62433
WEBSTER T F 62759
WEIGLE J L 62152
WEILL H *61691
WEIR F W *61880
WEISFELDT M L 61613
WEISS H S 61433
WEISS K D *61433
WENZEL D G *61799
WERCZBERGER E *62667
WESOLOWSKI 62662
WESTER L 62248
WESWIG P H 61462
WETHERILL G 61787
WHANGER P D 61462
WHITE J C *62572
WHITE L J 62713
WHITE R 62225
WHITE S W 61775, *61844
WHITLOCK J P JR 61800
WIDMAN G L *62573, *62574, *62575
WIEBEL F J *61800
WIELAND R C 61745
WIESTER M J *61692
WIETHAUP H *62727
WILDMAN J M *61434
WILFERT G L 62636
WILKEY M L *62576
WILLIAMS R 61776, 62255
WILSON K *61801
WILSON K R *62577, 62759
WILTON A C 62034
WILTSEE K W JR 62527
WINCHESTER J W 61466, 61953
WINKLER K *62308
WINNEKE G *61693
WINSLOW J J B *61694
WINTHROP S O *62578
WISLER M M 62263
WITT E *62579
WIXSON B G *62580
WOITOWITZ H J *61881
WOJCICKA I *62199
WOJCIECHOWSKI J *61911
WOLBACH C D 62242
WOLFF R K *61695
WOOD T *62085
WOOLCOCK A J 61769
WRIGHT C *62286
WRIGHT H T 61892
WULLSTEIN L H *62200
WUSTEMAN F S 61896
WYATT J R 62209
WYSOCKI C M 61745

Y

YABE T 62119
YABUKI M *62086
YAGYU H *61845
YAKHIMOVICH N P *61696
YAMADA H 62192
YAMADA K 61389
YAMADA S *62581
YAMAGA G 61910
YAMAGA M 61663, *61697
YAMAGA S *61882
YAMAGA Y *62132
YAMAGATA H 61473
YAMAGIWA M 61603
YAMAGUCHI C 62012
YAMAGUCHI M 62171
YAMAMOTO H *61435
YAMAMOTO K 61423, 61424, 61425
YAMAMOTO M 61389
YAMAMOTO N *62668
YAMAMOTO S 61783
YAMAMOTO T 61648, 62072, *62087, *62088
YAMAMURA Y 61367
YAMAOKA K 61791
YAMASHIRO M 62083
YAMASHITA K 61959
YAMASHITA S 61877
YAMASHITA T *61698, *61699
YAMAZAKI H 62708
YAMAZAKI M *62582
YAMAZAKI S *61436, *61437
YAMAZOE F 61942, *61972, 62029, *62089, *62090, *62091, *62092, *62093, *62094, 62172, 62193
YAN C S *62258
YANAGIDA A 62039
YANAGISAWA S *61973
YANAMI M 62453
YANG S F *62157
YANO A 61791
YANO Y 61488
YATOMI K 62189
YAZAKI K 61591, *61700, 62067
YEAGER K E *62703
YEH H C *61802
YELFIMOVA Y V 61790
YODA H *61701
YOKOBORI M *61974, *62158
YOKOO Y 61418
YOKOYAMA E 61364, 61510, *61702
YOKOYAMA M 61604
YONEDA M 61543
YONEKAWA E 61551, 61598, 61601, 61602
YONEYAMA T 61996, 61997, 61998
YOSHIDA A 61349, *61703
YOSHIDA J 62025
YOSHIDA K 61375, *61438, 61514, 61515, 61516, 61534, *61704
YOSHIDA M 62194, 62525
YOSHIDA R 61578
YOSHIDA S 61537
YOSHIDA T *61439, 62067
YOSHIDA Y *62095
YOSHII S 62018
YOSHIKAWA H *61440
YOSHIMATSU S 61488
YOSHIMURA H 61653
YOSHINARI H *62583
YOSHINO A 62477
YOSHIOKA K *61975
YOSHKOV G G 61837
YOUNG H A 62669
YOUNG R A 61778, *62669
YUMIBA Y 62183

Z

ZAGMEN J *61846
ZAIDI S H 61594
ZAJUSZ K 61863, 61864
ZAKHIDOV A Z *62670
ZAMFIR G H *61883
ZARYTKIEWCZ E D *62584
ZELENKO V 61765, 61865
ZIEGENHORN K *62218
ZIEGLER H 62140
ZIELHUIS 61751
ZIMDAHL R L 62105
ZIMMER C E 62356
ZIMMERMANN D *62268
ZISKIND M 61691
ZLATEVA M *61847
ZOBER A 61629
ZUPAN J M *62275
ZVINYATSKOVSKIY Y I 61635
ZWERNEMANN K *62227

ORDER FORM

USE RESTRICTED AS INDICATED IN THE INTRODUCTION

SEND TO:

ENVIRONMENTAL PROTECTION AGENCY
AIR POLLUTION TECHNICAL INFORMATION CENTER
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

Date ______________________

Name ______________________

Program ______________________

Address ______________________

THIS FORM IS TO BE USED FOR ORDERING MICROFICHE DUPLICATES. INDICATE THE ARTICLES YOU REQUIRE BY CIRCLING THEIR APTIC NUMBERS. IF YOU DO NOT HAVE ACCESS TO A MICROFICHE READER, YOU MAY REQUEST PAPER COPIES. HOWEVER, MICROFICHE CAN USUALLY BE PROVIDED IN ABOUT 1/5 THE TIME REQUIRED TO PROVIDE PAPER COPIES.

20820 24309 25198 33442 33803 34400 34555 35210 35274 35486 35704 35710 35714
35804 35820 35822 35854 36272 36555 36621 36968 37500 37983 38250 38357 38440 38537
38688 39930 40216 40260 40337 40587 40588 40592 40599 40653 40794 40846 40847 40920
41233 41247 41308 41309 41313 41325 41327 41594 41606 41689 41690 41993 42158 42211
42238 42393 42435 42491 42496 42497 42507 42508 42509 42510 42511 42512 42513 42514
42515 42516 42517 42518 42519 42520 42521 42522 42524 42526 42527 42528 42529 42530
42531 42532 42533 42534 42535 42536 42537 42542 42543 42544 42547 42548 42551 42552
42553 42558 42561 42568 42569 42570 42571 42573 42580 42592 42594 [illegible] 42763 42835
43000 43001 43007 43028 43034 43043 43046 43047 43052 43055 43062 43064 43070 43082
43120 43359 43412 43591 44052 44446 45783 46223 46283 47144 47255 47323 47546 47899
47995 48028 48067 48395 48474 48747 48915 48924 49058 49390 49672 49817 49884 49914
50061 50254 50282 50736 50887 51336 51340 51669 54257 67056 67066 67067 67070 67074
67107 67109 67111 67114 67118 67122 67135 67138 67141 67142 67143 67161 67162 67164
67165 70545 70576 70622 70666 70690 70718 70736 71506 72457 72458 72533 72534 72580
72601 72664 72665 72722 72762 72828 72880 72933 73034 73176 73178 73183 73361 73364
73365 73367 73388 73410 73411 73412 73532 73558 73559 73595 73940 74735 75190 75208
75311 75333 75366 75919 75921 75952 75953 75954 75955 75964 75967 75968 75969 75970
75997 76010 76012 76014 76015 76038 76043 76046 76053 76054 76055 76056 76057 76062
76077 76078 76079 76080 76081 76082 76085 76086 76102 76138 76139 76141 76147 76160
76161 76163 76164 76165 76166 76167 76168 76169 76170 76171 76172 76173 76174 76176
76177 76178 76179 76180 76193 76197 76198 76205 76206 76213 76217 76221 76222 76228
76233 76238 76240 76241 76246 76250 76254 76256 76260 76263 76271 76276 76277 76278
76279 76286 76291 76293 76295 76297 76298 76299 76305 76306 76308 76316 76321 76328
76329 76330 76335 76340 76341 76342 76343 76344 76348 76349 76373 76380 76381 76383

76385	76387	76393	76396	76397	76401	76407	76412	76414	76424	76433	76434	76444	76447
76450	76451	76452	76453	76454	76456	76457	76460	76461	76465	76473	76483	76488	76489
76491	76494	76497	76498	76501	76502	76507	76511	76518	76521	76526	76529	76534	76539
76541	76552	76562	76566	76567	76584	76591	76592	76595	76596	76597	76604	76605	76608
76609	76610	76611	76618	76619	76622	76626	76632	78995	79066	79074	79170	79172	79199
79234	79235	79236	79237	79240	79241	79253	79255	79257	79265	79267	79268	79269	79270
79271	79272	79275	79277	79287	79296	79297	79361	79396	79423	79579	79580	79581	79582
79583	79584	79585	79586	79587	79588	79596	79608	79612	79613	79619	79620	79621	79622
79623	79624	79629	79630	79631	79632	79633	79634	79635	79636	79638	79642	79646	79647
79649	79651	79655	79661	79664	79669	79671	79672	79673	79674	79675	79676	79678	79681
79682	79683	79687	79688	79692	79694	79696	79699	79700	79701	79702	79703	79704	79705
79706	79707	79708	79714	79715	79718	79720	79722	79729	79730	79731	79733	79736	79737
79738	79739	79740	79743	79744	79746	79755	79756	79758	79766	79767	79768	79770	79785
79788	79790	79791	79792	79793	79794	79795	79796	79797	79798	79812	79813	79814	79816
79819	79831	79887	79890	79893	79894	79895	79896	79899	79900	79919	79943	79945	79966
79969	79972	79973	79974	79975	79976	79977	79978	79979	79980	79981	79983	79984	79985
79986	79987	79988	79997	79998	80003	80010	80012	80013	80018	80020	80021	80022	80023
80026	80027	80029	80032	80033	80038	80041	80042	80046	80051	80052	80053	80055	80056
80057	80058	80060	80061	80062	80063	80064*	80065	80066	80067	80068	80078	80079	80080
80081	80082	80083	80084	80085	80096	80099	80119	80120	80122	80123	80125	80127	80134
80135	80136	80137	80138	80144	80148	80155	80157	80158	80160	80161	80165	80167	80172
80173	80177	80178	80189	80193	80195	80197	80198	80199	80200	80202	80206	80207	80209
80215	80217	80221	80232	80234	80243	80245	80247	80248	80249	80250	80258	80265	80270
80278	80279	80294	80296	80301	80308	80313	80315	80318	80320	80324	80326	80336	80337
80346	80350	80351	80353	80357	80358	80360	80403	80451	80458	80466	80467	80468	80476
80477	80481	80488	80493	80494	80542	80553	80610	80622	80676	80768	81086	81090	81091
81098	81181	81249	81284	81311	81393	81433	81456	81495	81501	81502	81504	81505	81506
81507	81508	81509	81510	81511	81512	81513	81522	81523	81524	81525	81527	81551	81599
81669	81720	81762	81763	81765	81766	81767	81768	81769	81770	81771	81775	81777	81783
81784	81785	81786	81789	81799	81807	81814	81817	81822	81826	81830	81834	81835	81836
81837	81841	81842	81858	81862	81864	81865	81866	81867	81868	81869	81873	81881	81899
81901	81927	81936	81937	81938	81939	81943	81945	81947	81948	81949	81951	81952	81957
81959	81967	81968	81972	81981	81982	82010	82013	82062	82063	82086	82087	82088	82089
82090	82091	82092	82093	82100	82101	82112	82113	82146	82153	82176	82186	82187	82188
82189	82191	82194	82204	82208	82224	82225	82226	82227	82228	82229	82230	82231	82232
82233	82242	82250	82251	82255	82256	82257	82258	82259	82260	82261	82262	82263	82264
82274	82278	82286	82315	82336	82337	82338	82339	82340	82341	82344	82351	82352	82355
82359	82363	82415	82416	82434	82435	82436	82437	82438	82439	82440	82441	82442	82447
82448	82455	82457	82458	82460	82461	82472	82480	82483	82497	82498	82499	82503	82504
82505	82519	82520	82533	82534	82547	82549	82550	82564	82565	82567	82568	82569	82595
82598	82606	82613	82631	82632	82636	82652	82707	82708	82716	82718	82724	82725	82729
82734	82750	82751	82761	82763	82774	82775	82776	82785	82788	82805	82813	82861	82862
82863	82865	82867	82868	82876	82877	83003	83004	83007	83016	83017	83022	83025	83027
83041	83054	83056	83058	83068	83069	83070	83072	83078	83080	83082	83083	83086	83087
83129	83143	83144	83145	83151	83157	83159	83175	83176	83177	83178	83179	83180	83181
83182	83183	83184	83187	83188	83189	83190	83191	83192	83193	83216	83224	83230	83238
83239	83240	83241	83244	83246	83247	83250	83252	83253	83254	83266	83288	83306	83307
83340	83341	83342	83362	83368	83372	83373	83379	83380	83381	83387	83408	83411	83414
83416	83417	83420	83428	83429	83430	83431	83432	83433	83436	83437	83440	83445	83446
83454	83462	83477	83489	83521	83530	83531	83533	83534	83535	83538	83539	83540	83541
83542	83544	83545	83546	83552	83566	83569	83583	83586	83587	83593	83598	83616	83642
83643	83644	83645	83652	83653	83654	83655	83657	83671	83672	83680	83681	83682	83683
83686	83688	83696	83697	83703	83704	83705	83706	83708	83710	83713	83717	83718	83719
83720	83721	83722	83723	83725	83730	83731	83732	83733	83734	83735	83736	83741	83758
83760	83767	83776	83779	83790	83792	83794	83796	83797	83798	83799	83800	83801	83803
83804	83805	83806	83809	83810	83811	83812	83813	83814	83815	83816	83820	83825	83843
83847	83849	83850	83851	83852	83853	83854	83855	83856	83857	83858	83859	83860	83861

83870 83873 83874 83878 83879 83883 83884 83885 83886 83887 83888 83889 83892 83899
83906 83907 83909 83924 83925 83931 83932 83937 83938 83939 83940 83941 83942 83943
83944 83946 83947 83955 83965 83971 83977 83981 83987 83988 83989 83999 84006 84008
84009 84010 84011 84012 84013 84014 84015 84016 84019 84023 84024 84025 84026 84027
84033 84047 84048 84049 84050 84052 84053 84055 84056 84057 84061 84066 84070 84078
84079 84080 84081 84082 84083 84088 84089 84090 84091 84092 84095 84096 84099 84101
84106 84107 84120 84122 84123 84130 84136 84137 84143 84151 84154 84156 84157 84158
84161 84168 84169 84170 84174 84203 84204 84220 84227 84233 84236 84237 84241 84242
84243 84244 84245 84253 84260 84266 84270 84274 84279 84280 84289 84290 84295 84296
84297 84306 84307 84308 84309 84310 84320 84322 84365 84373 84378 84380 84385 84388
84393 84394 84395 84404 84409 84415 84416 84417 84419 84434 84435 84443 84444 84445
84446 84452 84453 84461 84467 84472 84473 84476 84477 84478 84483 84484 84486 84487
84488 84492 84498 84500 84501 84502 84503 84504 84505 84506 84507 84508 84509 84510
84511 84512 84513 84514 84515 84516 84517 84519 84520 84522 84523 84524 84525 84526
84527 84528 84529 84530 84531 84532 84533 84534 84535 84536 84538 84539 84540 84541
84543 84544 84545 84546 84547 84548 84549 84550 84551 84552 84553 84554 84556 84557
84558 84559 84561 84562 84563 84565 566 84567 84568 84569 84570 84572 84573 84574
84575 84576 84577 84578 84579 84580 81 84582 84583 84585 84586 84587 84588 84589
84590 84591 84592 84593 84594 84595 84596 84598 84599 84610 84611 84615 84619 84627
84628 84630 84631 84639 84640 84641 84642 84643 84644 84645 84646 84648 84649 84650
84651 84652 84653 84654 84655 84657 84658 84661 84663 84664 84668 84669 84673 84674
84675 84676 84677 84678 84679 84685 84686 84687 84688 84689 84690 84691 84692 84693
84694 84695 84696 84697 84698 84699 84705 84712